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MAGAZINE

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**Our Newest
JET BOMBER...**
an artist's conception
of the delta B-58
—See page 89

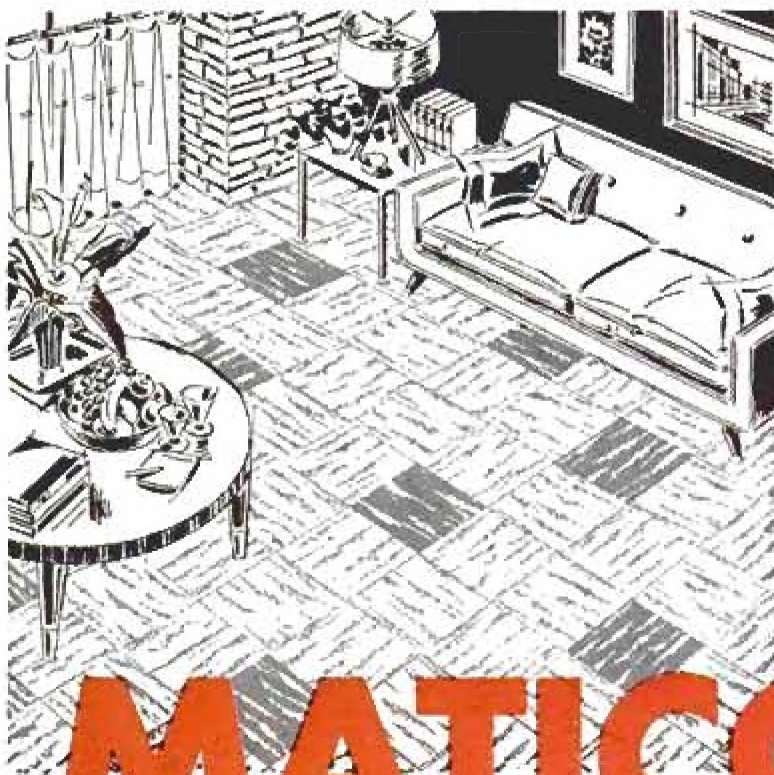


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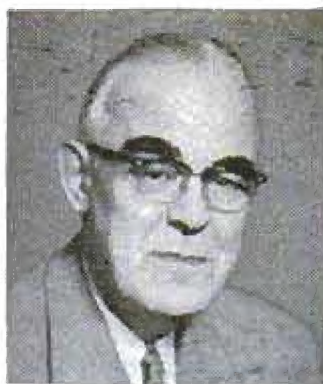


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H. T. FRIIS. Medal of Honor, Institute of Radio Engineers, and Valdemar Poulsen Gold Medal, Danish Academy of Technical Sciences; important work in application of short and ultra-short radio waves.



CLAUDE E. SHANNON. Stuart Ballantine Medal, Franklin Institute of the State of Pennsylvania, for contributions to a comprehensive theory of communication.



W. G. PFANN. Mathewson Gold Medal, American Institute of Mining and Metallurgical Engineers, for discovery of and pioneering research in zone melting.



H. F. DODGE. Shewhart Medal, American Society for Quality Control, for original contributions to the art of statistical quality control.



R. KOMPNER. Duddell Medal, Physical Society of England, for his original work on the traveling wave tube.

These are some of our recent medal winners at Bell Laboratories. The awards they have won symbolize recognition for outstanding achievement in the many sciences that bear on telephony. Bell Labs is extremely proud of them—and of the thousands of scientists and engineers who work with them to keep the American telephone system the greatest in the world.



WALTER H. BRATTAIN. Co-winner with Dr. John Bardeen of John Scott Medals, City of Philadelphia, for invention of the transistor.

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Next Month

When Cecil York got tired of answering the gag question "how do you wind it?" he installed a big key on the back of his Volkswagen for a trip from San Fernando, Calif., to Missouri. For a key to the success of this little German car, you can read next month what the American owners of Volkswagens have to say about it. Our report on questionnaires sent to the Volkswagen owners will appear in the October issue

Sources of further information not listed in the index, starting on page 74, about articles in this issue, frequently are shown in the Where-to-Find-It List prepared for each issue. A copy may be obtained by readers, without charge, from Bureau of Information, Popular Mechanics, 200 East Ontario Street, Chicago 11, Ill.

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for other items and manufacturers of available products

Engineer's Report:
1956 CHEVROLET

HERE'S WHY IT'S EASY TO "POINT" A CHEVROLET

By **ED COLE**, *Chevrolet Chief Engineer*

After you've driven a new Chevrolet for a while you'll find that one of the most satisfying things about it is its steering. You "point" it where you want it to go and it goes there—with superlative ease and precision.

The secret is **Ball-Race** steering, in which 54 micro-polished steel balls provide *rolling* friction instead of the usual

sliding friction. The "drag" of friction is reduced to the lowest point we can get it. And, in addition, the *weight* on the front wheels is lightened by moving the center of balance farther back.

The result is exceptionally light-handed steering—manual steering that comes awfully close to the ease of power steering. Better still, the improved weight distribution gives Chevrolet better rear wheel traction and better roadability.

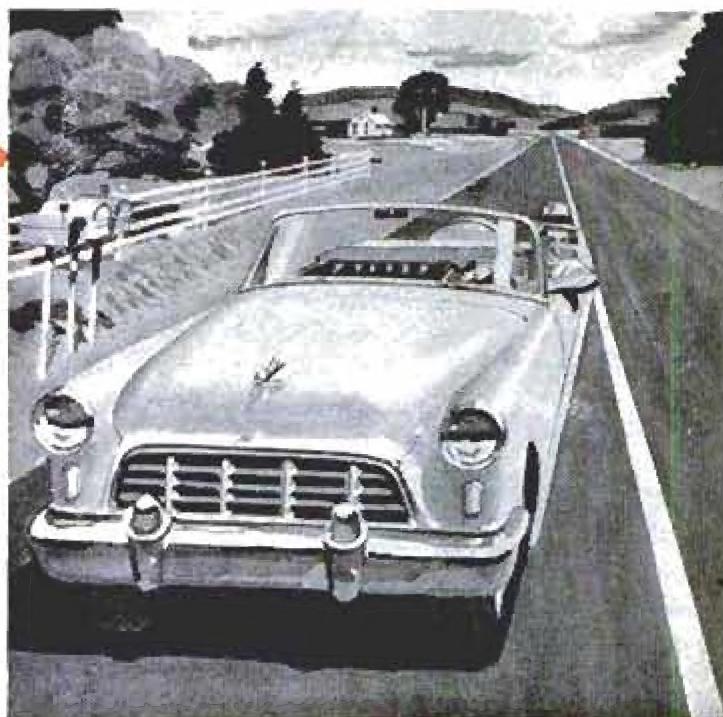
Our ideal at Chevrolet is to produce the best *road* car the world has ever seen—and Ball-Race steering is a big factor. Your Chevrolet dealer will be glad to arrange a demonstration so you can sample it for yourself—a preview of the additional pleasure Chevrolet can give you during every mile you drive. . . . Chevrolet Division of General Motors, Detroit 2, Michigan.



Texaco Tips On Car Care

How to test your brakes

Be sure that all tires have equal and correct pressure, then drive to a hard-surfaced road where there is no traffic. Then, at twenty miles per hour speed, hit the brakes fast and hard. If your car doesn't stop within twenty feet, or it pulls to one side, or only one tire makes a scuff mark, your brakes need expert attention. If you have to pump the brake pedal, probably the hydraulic fluid level is low, or air is in the system. For safety's sake, don't delay any brake work found necessary.



How to enjoy "cushiony" motoring

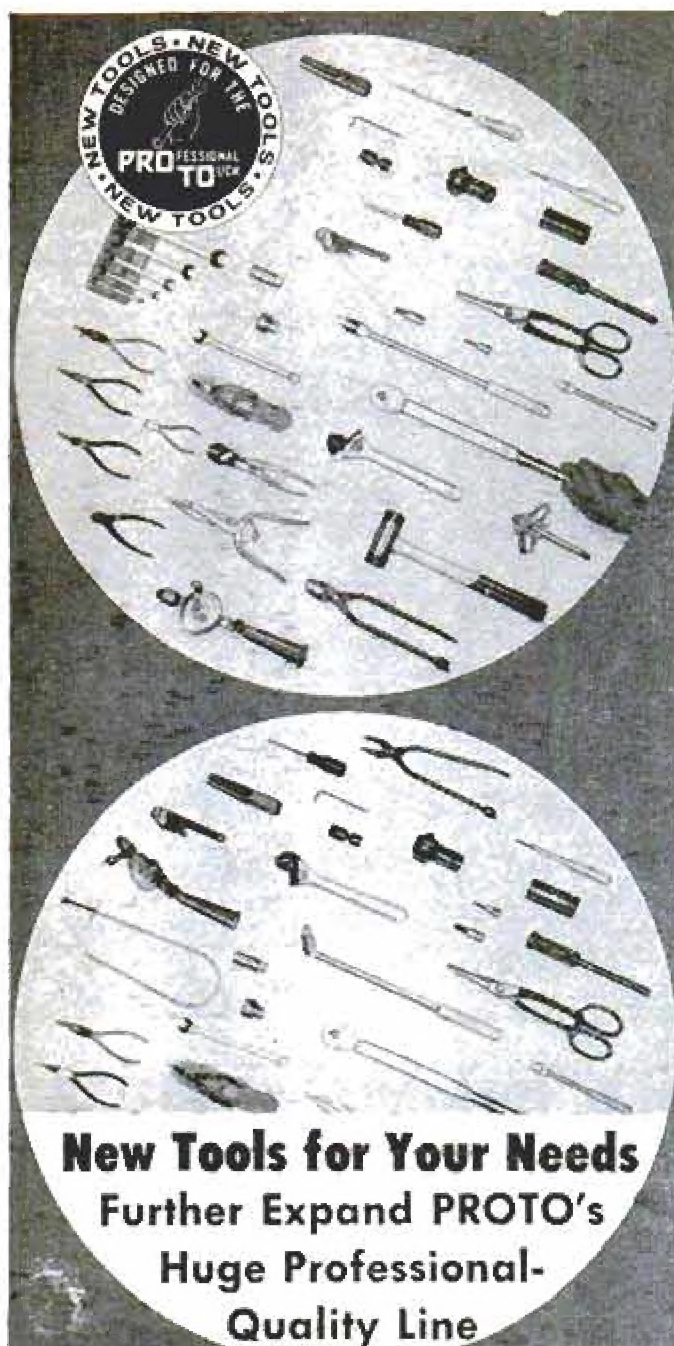


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ACROSS THE DESK



To the Editor:

On behalf of the officers and men of the Civil Engineer Corps and Seabees, I want to compliment you and Mr. Richard E. Dempewolff on the excellent articles in your April and May issues, "Seabees Build a Town Under Antarctic Ice."

These articles are the most thorough and complete that we have seen of our participation in Operation Deepfreeze, and we are proud of your excellent and very interesting coverage and pictures.

We have publicized these articles to our people. However, it is such a fine presentation that we would like very much to have permission to reprint it, or portions, in our official monthly publication for our Reserve Officers, the "CEC Bulletin." We would appreciate very much having your permission to do so.

Again, our sincere congratulations to you and to Mr. Dempewolff.

R. H. Meade,
Rear Admiral, CEC, USN,
Chief of Bureau of Yards and Docks,
Washington, D. C.

To the Editor:

I have just finished reading "Look What Happens When the Atom Strikes a Valley" by Clifford B. Hicks, in your May 1956 issue. I am wondering if I could obtain permission to use the material in this article in making certain off-the-cuff speeches in my home state.

I frequently have invitations to speak unexpectedly in communities which have expressed a desire for the establishment of a gigantic atomic-energy project. The article expresses the possibilities, both good and bad, in such a way that I find it entirely adequate to my purpose.

I would, of course, give *Popular Mechanics* Magazine credit for gathering this information.

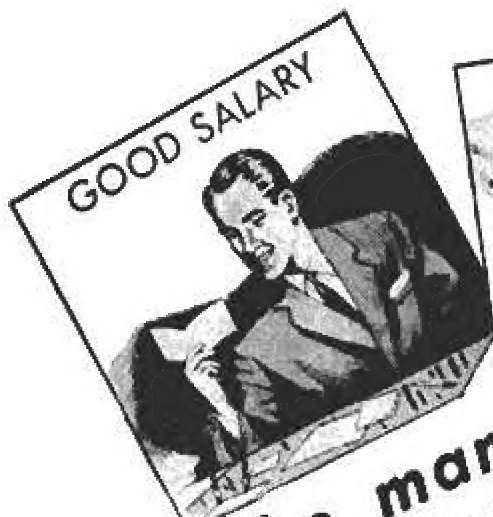
Clinton P. Anderson

New Mexico's Senator Anderson is chairman of the Joint Committee on Atomic Energy of the United States Congress.

Editor's Note

Commenting on the "tripont sloop" pictures on our July cover, Comdr. Victor

(Continued to page 8)



To the man who wants to enjoy an ACCOUNTANT'S CAREER

FREE SAMPLE LESSON

IF you're that man, here's something that will interest you.

Not a magic formula—not a get-rich-quick scheme—but something more substantial, more practical.

Of course, you need something more than just the desire to be an accountant. You've got to pay the price—be willing to study earnestly, thoroughly.

Still, wouldn't it be worth your while to sacrifice some of your leisure in favor of interesting home study—over a comparatively brief period? Always provided that the rewards were good—a salary of \$4,000 to \$10,000 and up?

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Your progress is as speedy as you care to make it—depending on your own eagerness to learn and the time you spend in study.

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(Continued from page 6)

Tchetchet of the International Multihull Boat Racing Association tells us he has been experimenting with trihulled boats since 1938. The commodore's first trimaran was launched in 1945 and raced in the 1946 Marblehead Race Week, was destroyed in a storm in 1950 and he then built another which won trophies in several regattas. A 20-foot trimaran designed by Commodore Tchetchet was the subject of a how-to-build article in PM's Craftsman section for July 1951.

To the Editor:

Many thanks for "How Would You Do It?" by Chris Nelson, in the July issue. This has helped me a lot in my shop work. Not only is the photography good, but you are to be commended on your safety features. I look forward to your continuing this as a feature of your subsequent issues.

Dr. Robert C. Bailie,
Waynesboro, Ga.

To the Editor:

In the newspapers lately there have been stories about runaway trucks down hills and mountains because of no brakes. I have an idea that may not seem too silly in this auto-minded world of today. Here it is:

You are starting down a mountainside and when you put your foot on the brake pedal, it goes to the floor. No brakes! You're moving too fast to use the emergency brake for fear the trailer truck will jackknife. You pull a lever that has a cable running under the truck to the rear of the trailer to a metal box 12 inches deep and 3 by 3 feet square. The cable pulls a latch out and two doors swing open like bomb bays on an airplane. After doors are open, a huge parachute falls behind and opens. The truck slows down rapidly. Then you use the emergency brake to bring the truck under control. From the time you discover you have no brakes till the time the chute opens it would take less than 30 seconds.

They use parachutes to slow down huge airplanes that come in for fast landings and they weigh much more than a loaded trailer truck. Parachute, box, cable, etc., would amount to about \$100. Consider a trailer truck hauling a pay load of \$5000 to \$10,000 over mountains two or three times a week, it would be worth the extra safety device.

C. L. Blundell, Jr.,
1709 S. Taylor St.,
Arlington, Va.

(Continued to page 10)

PICK YOUR OWN SUCCESS STORY FROM THIS PAGE

These are the true stories of people who seemed trapped in routine, low-pay shaky jobs. Handicapped by lack of proper training, they couldn't get the things they wanted out of life—more money, a job they liked, security and happiness.

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Are you discouraged with your job and pay and feel you can't improve yourself because of lack of specialized education? Well, these men and women were in the same boat. With I. C. S. training, one of these success stories could be about you.

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"As a college graduate, I found I.C.S. very valuable." Robert Lee took the I. C. S. Course in Advertising, is now Promotion Manager for a large corporation. "I. C. S. got me started on the way up," he says.



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(Continued from page 8)

To the Editor:

I am a reader of your magazine. It is very excellent and wonderful, especially the articles for the craftsman.

I am very interested in modeling small planes and machines. Now I want to make a jet engine for my bicycle, so I would be very thankful if you would send me some details for this.

Farouk Ismail,
Saddar Bazar,
Hyderabad, West Pakistan

☆☆☆

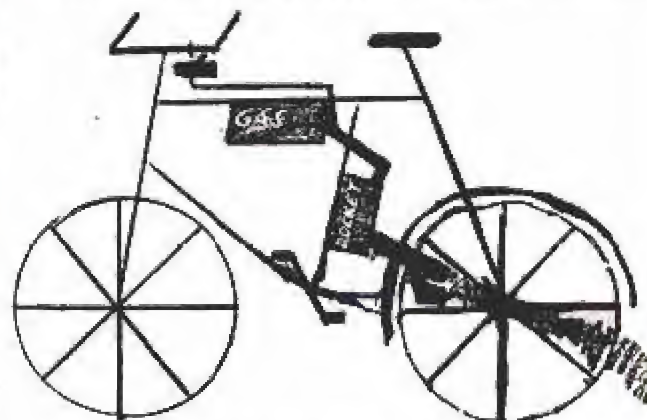
Back in December 1947, PM reported the construction by William Tenney and Charles Marks at Dayton, Ohio, of what



was acclaimed the world's first jet-propelled bicycle (above), powered by three tiny jet engines developed for model planes. Our Automotive Editor, Art Railton, didn't recall this, however, and thought the idea was impractical. He took the letter home and showed it to his sons.

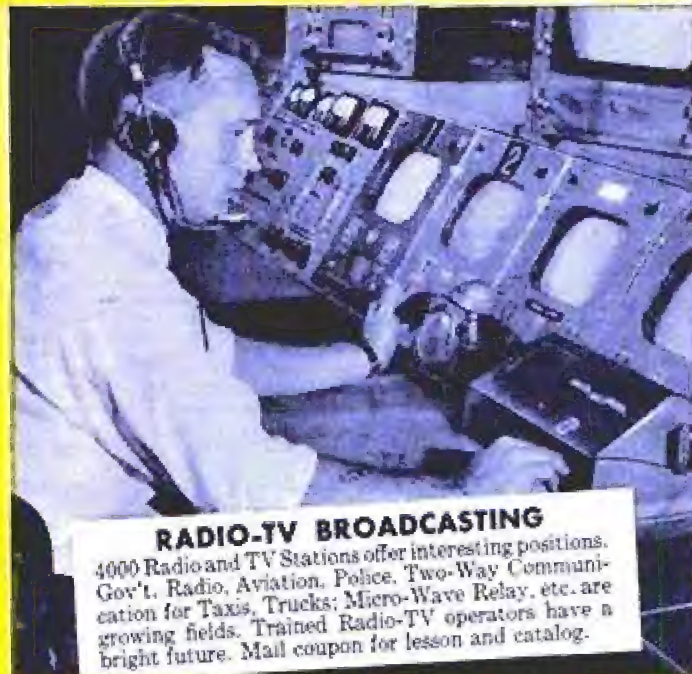
"Don't be silly, dad," replied Steve, aged seven. "I'll show you how to build one."

Here is Steve's solution of the problem:



*put gas tank on
cross bar put a
pipe down to
rocket*

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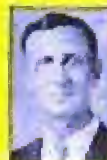
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J. L. Smith
founder

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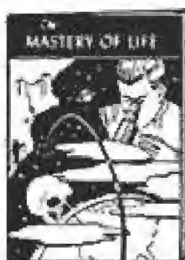


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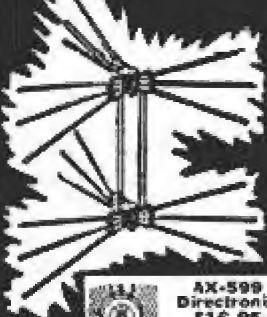
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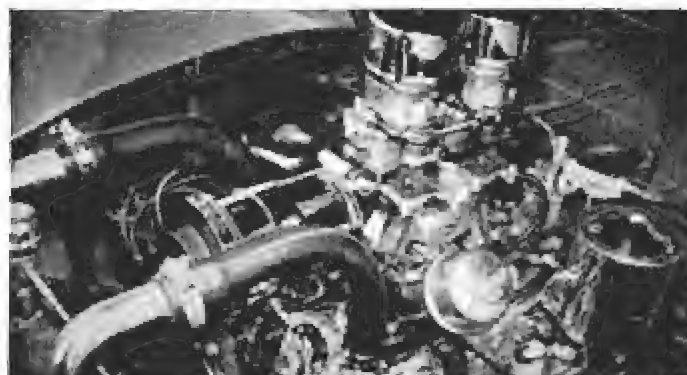
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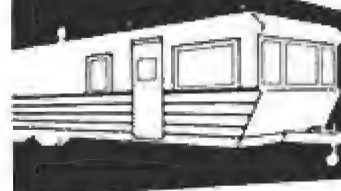
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750-16 (d)	7.42	800-15	5.72	800-20	9.62	1000-20	19.72
850-16	4.62	820-15	5.72	850-20	10.72	1100-20	19.72
850-17	4.72	870-15	5.15	32x8 (d)	10.32	1000-22	20.92
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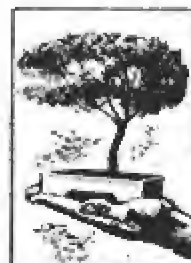
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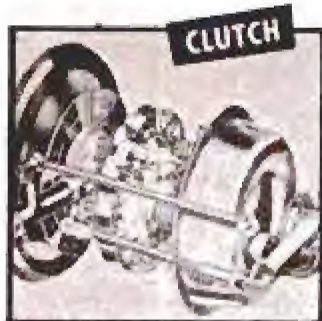
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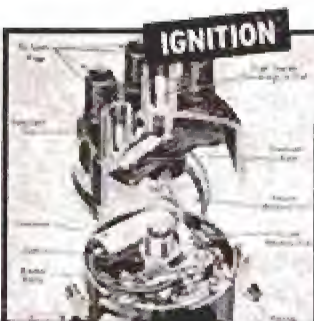
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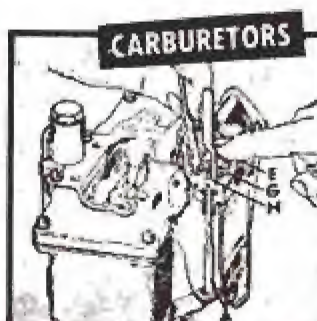
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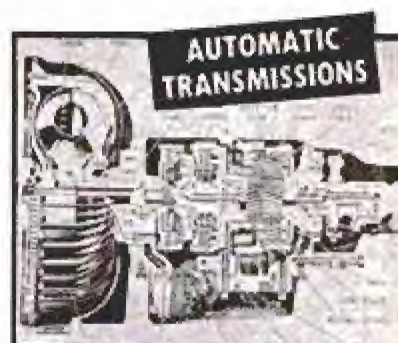
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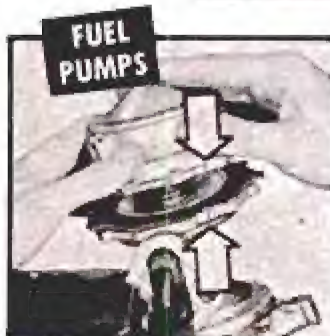


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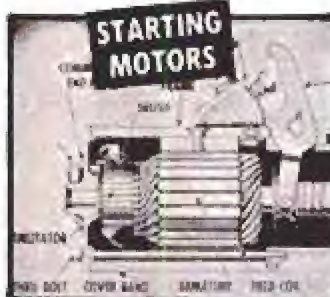


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SALESMEN GETTING UNBELIEVABLE SENSATIONAL NEW LIGHTING DISCOVERY



Stuart G. Nelson, President
SUNRAY PRODUCTS CORP.

If you can throw a switch, a revolutionary new kind of Fluorescent Lamp can lead you to earnings of \$200 to \$400 a week, and more—and create a "retirement" income on your repeats!

The bare facts about this invention are so fantastic that they sound like wild exaggerations. Yet every statement is true—as you will see when you read my letter.

Preliminary sales work shows fortunes will be made by the salesmen who have the vision to see the tremendous possibilities in the swelling National surge toward "better seeing." Read with care. It may be another decade before you have another opportunity as important as this.

To enable you to understand this opportunity I will have to tell you the difference between "lighting" and "illumination." Lighting is the source of light—illumination is the useful result of lighting. You install lighting to provide illumination. Different human activities require different kinds of illumination. And the illumination varies in two ways: (1) The *amount* of light delivered, and (2) The *color* or *character* of the light delivered.

Until recently all of man's inventive genius was aimed at producing *more light* from a given amount of electricity.

The search for more light culminated in the development of the Fluorescent lamp. Per watt of current used it gave a higher level of light than any incandescent lamp—about two-and-a-half times as much. It gave a whiter, stronger, more brilliant light. The nation's storekeepers, offices, and manufacturing plants switched to Fluorescent with breathtaking speed. But then came a shock.

A backlash

Fluorescent lamps are affecting the eyes of the people who work under them. Eye strain has risen to an all time high level. Nervous disorders are on the increase. The efficiency of employees is showing a serious drop-off due to tensions caused by eye strain.

The cause? GLARE! Glare is reflected light entering the eye at an angle different from the angle at which the eye is focused. Fixture manufacturers

have adopted scores of louvers for their fixtures in an attempt to cut down glare. But these louvers cut down the amount of light delivered to the working area—particularly as they become crusted with dust.

And, in spite of partial reduction, glare continued.

until—

Sometimes—more often than not—inventors and engineers who know the subject best, get so complicated in their thinking that they overlook the simple things. And most great inventions are simple.

A simple invention

The new SUNRAY lamp is such an invention. It is so simple that when you see it, you will wonder why the engineers hadn't thought of it years ago. Yet it is so radically different that patents have been granted on the methods for making it.

The claims made are so fantastic that no amount of talk by the most convincing salesman could make a prospect believe. Yet one simple Three-Minute Demonstration—with Four Lighted Tubes give such dramatic proof to the prospect's own eyes that he knows every claim is true—he knows that he **MUST** have SUNRAY LAMPS for his store, office or factory.

Throw the switches— write the orders!

In our demonstration case there are four Fluores-

WEEKLY CHECKS DEMONSTRATING FOR FACTORIES, STORES AND OFFICES

cent lamps and four switches. Snap the first switch and you have the light from a standard fluorescent lamp shining down on a printed sheet of paper. The eye is repelled by glare. You snap the second switch. The SUNRAY lamp lights up. The contrast is almost as night from day. From one paper the glare still slams into the eye. From the other side, no glare. Just a soft, restful, but adequate illumination.

The effect on the prospect is as instantaneous as the demonstration. He needs no "selling" for he has seen what ten thousand words would not have made him believe. The order is ready to write.

But wait. One more surprise!

SUNRAY made a second discovery. It relates to COLOR. Lights of different colors create startling differences in the way different things appear to the eye. Under standard fluorescent lamps food, faces, clothing, furniture and painted surfaces look unnatural. The colors are not true. Color distortion is often so great that the merchandise displayed looks uninviting.

There is no one fluorescent lamp that will make all colors appear as they do in daylight—not even the lamp that is called a Daylight lamp. But SUNRAY engineers found the secret of COMBINING lamps of different tints to give the exact illumination that is best for each type of business. In different combinations, they can be made to improve the appearance of any product—whether it be a steak, a head of lettuce, a fine cabinet, a suit, pair of shoes, a woman's hat or dress, or an automobile.

An instant success

And the next two SUNRAY lamps in your demonstration case permit you to show this difference so dramatically that the prospect starts selling you.

This is not guesswork on my part. I'm not talking about what I hope will be the case. For the last four years we made selling tests in scattered territories.

We were optimistic. We had great hopes. But the actual sales records made our wildest hopes seem pale. One of our men in a Mid-West state has made an average of more than \$200.00 a week from the first week, he started three years ago. He has made as much as \$480.00 in one week. And, right now, he is getting repeat orders from 75% of his original customers—three out of four. His repeat-order business alone would keep him living like a king the rest of his life.

The story is the same with thirty other men. Stead-

ily adding customers. Increasingly easy to sell. The demonstration does it. Some of the biggest names in industry are already permanent users.

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If you can qualify— send your name

The information is free, naturally. It is complete—so complete that after reading my letter you will either say this is one of the greatest opportunities you have ever had, or you'll say, "It's not for me." If selling is your profession, then you will not want to take a chance on missing the SUNRAY opportunity—at least not for the cost of a three-cent stamp. Send your name and address. I'll mail a complete, down-to-earth presentation which discloses every angle of this great business. Then you can decide whether this is the opening you've longed to find.

Stuart G. Nelson, Pres., SUNRAY PRODUCTS CORP., 1617 Lexington Ave., Warren, Pa.

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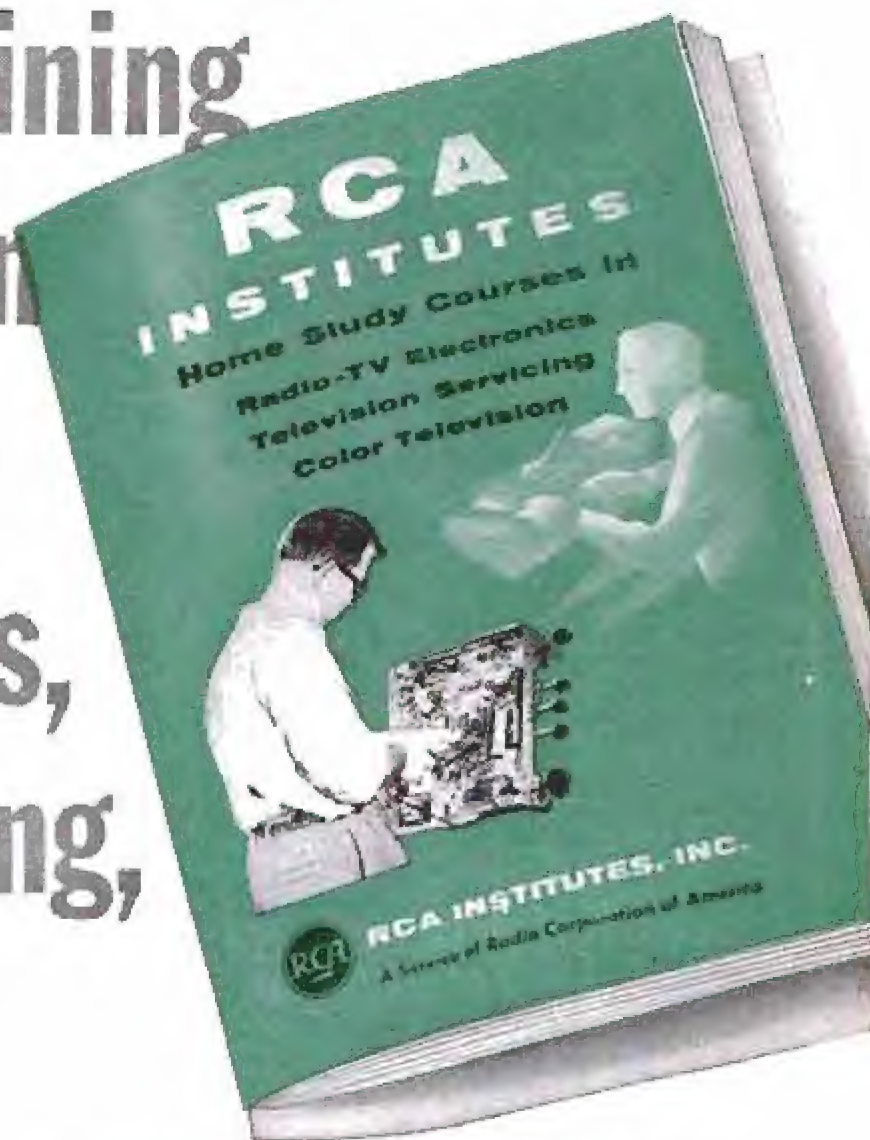
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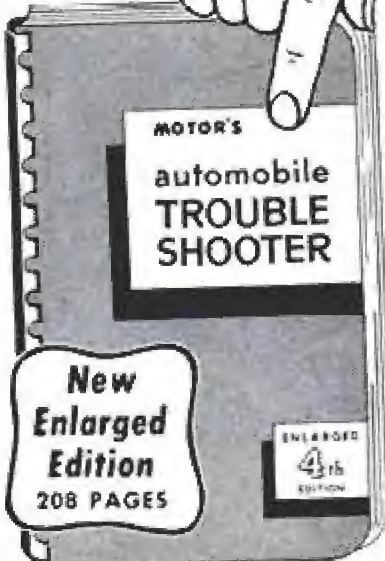
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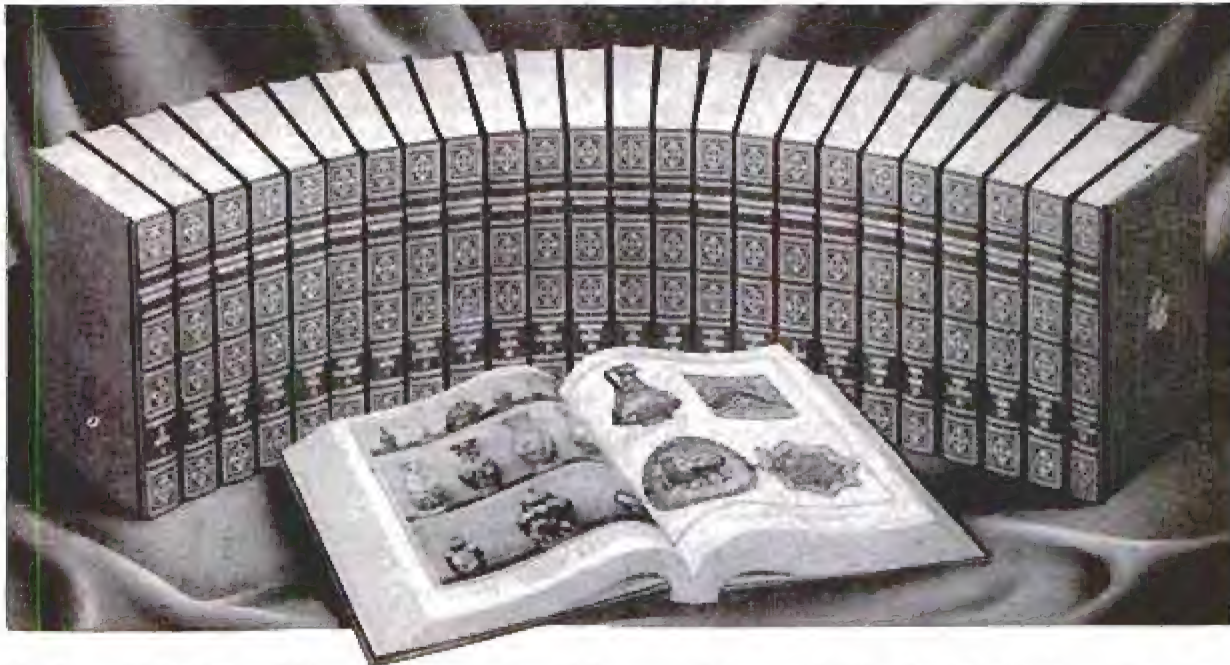


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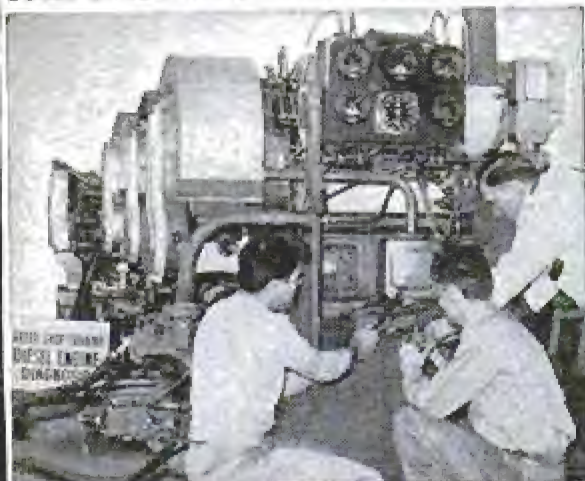
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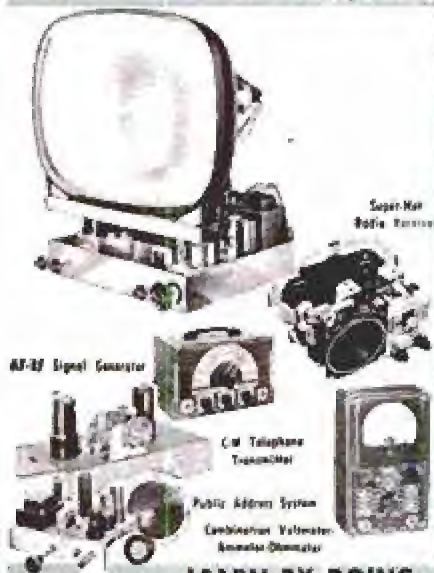
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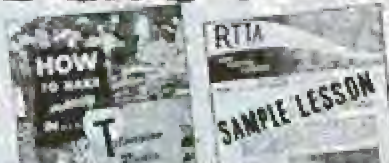
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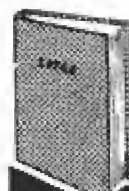
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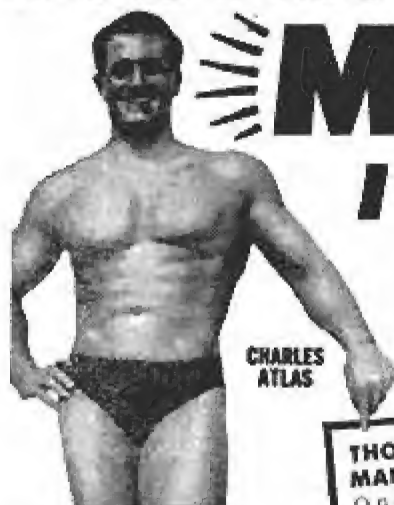
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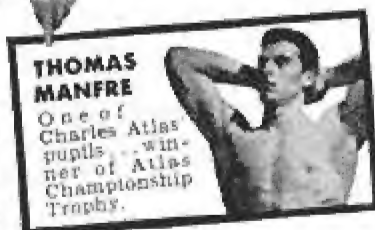
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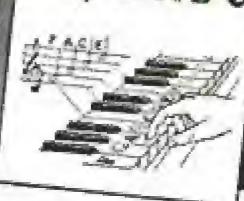
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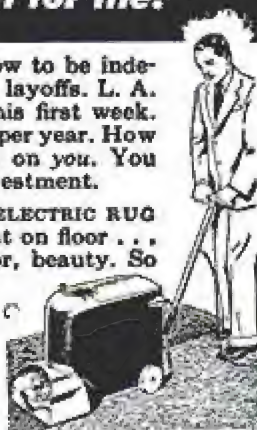
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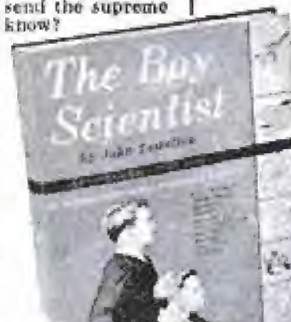
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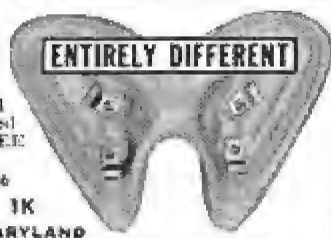
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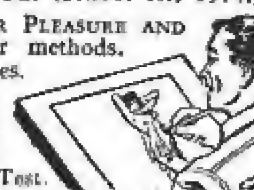
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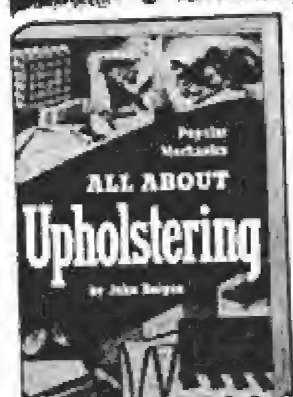
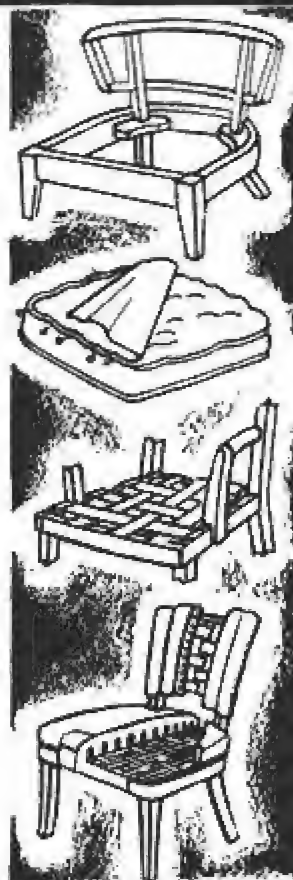
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640-15	6.66	820-15	6.66	700-15(0)	6.60	825-20	19.45
700-15	6.66	820-15	6.98	750-15	7.40	800-20	20.00
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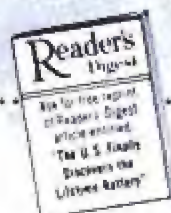


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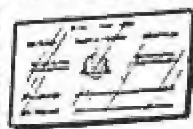
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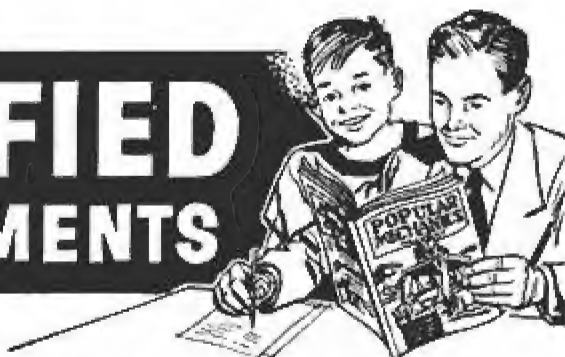
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MAIL Order plus know-how equals success plus independence. Get "How to Sell by Mail," at once. 25¢ postpaid. Coin or stamps. Richard Hyland, 1014-4th Street, Santa Monica 1, California.

\$46 FROM Square foot plywood with your jigsaw. Woodart, Bridgewater, Mass.

HAVE Profitable home mailorder business selling quilt pieces, remnants—Full, sparetime! Over 20,000,000 "repeat" prospects! Rush name for details of this amazing money-making business today! Coleman, Box 821-A, Newark 1, N. J.

MAIL Catalogs featuring real merchandise. Charles, Box 32-P, New York 63, N. Y.

AGENTS, Salesmen, others. 100% sales increase in 30 days. Your total cost a self-addressed #10 manila envelope or 10¢ sent to Sales Booster, 3000 Booker, Fort Worth 11, Texas.

\$28,500 SALES in two weeks! Amazing radio-mail order method. Free details. Broadcast Service, 1412-SP Great Northern Building, Chicago 4, Illinois.

\$200 WEEKLY Applying Sun-Shield miracle tint. Small investment. Free details. Trans-World, Department PM, 1707 North Alexandria, Los Angeles 27, Calif.

TO Survive as a salesman—Know the tricks of sales resistance. Free facts. Countersalesmanship, Dept. D, 120 Boylston Street, Boston 16, Massachusetts.

SELL New nationally advertised 17 jeweled watches. Your cost \$8.95. Watch sets \$5.95. Result Sales, Dept. M, 580 Fifth Ave., New York City.

BIG Profit low cost English chamoms. Recorders 100%. Babrok, Hudson Falls, N. Y.

FREE Booklet, earn money at home schemes. D. Reuter, 120 Boylston Street, Boston 16, Massachusetts.

TO \$100 Weekly operating home mail-order business. Write: National Service, Richland, Georgia.

WHOLESALE Buyers service! Buy nationally advertised merchandise wholesale. Sell way below retail. Fabulous profits. Write Wholesale Buyers, Box 22-PH, St. Louis 3, Missouri.

BIG Profits making candies. Particulars free. Raymond Schenck, Butler, Penna.

AMBITIOUS? We establish you in your own business, supply catalogs, circulars, etc., ship orders under your label, show you exactly what to do. Experience unnecessary. No stock to carry. Sell direct, through agents, by mail. Postcard brings catalog, booklet "How To Make Money in Your Own Business," and money-making plans absolutely free. Topval Corp., Lindenhurst 918, N. Y.

MONEYMAKING OPPORTUNITIES

GROW Mushrooms. Cellar, shed. Spare, full time, year round. We pay \$3.50 lb. We paid John Betts \$7,977.76, he started as amateur. Free book. Mushrooms, Dept. 173, 2854 Admiral Way, Seattle, Wash.

EARN Money immediately repairing electric clocks without experience. \$3.00 investment. Details free. Puthuff, Box 1504, Santa Rosa, Calif.

LEARN Technical Metaphysics and insure your future. Easy, inexpensive correspondence course. Simplest method known. Diploma. Write: Premier College of Technical Metaphysics, 2332 McKenzie St., Vancouver 8, B. C., Canada.

EARN Money evenings copying and duplicating comic cartoons for advertisers. Advice, Argyle 1, Wisconsin.

FREE Book "505 Odd, Successful Businesses." Work home. Expect something odd! Pacific, Oceanside, Calif.

READ Progressive Mailtrade, the magazine that tells how to make money by mail. Dime brings sample and special offer. Progressive Mailtrade, Box 357, Sheboygan, Wisconsin.

SELL Titania gems; far more brilliant than diamonds. Catalog free. Diamonite, 2420-M 77th, Oakland 5, California.

PRIZE Contests provide fabulous and confidential home income opportunities! Here's how and where to win your share! Send stamp! National Contest Bulletin, Box 2685-P, Miami 16, Florida.

FREE Folio "\$5,000-\$45,000, Unlimited Vacations." No merchandise, equipment. Unknown! Work home, sparetime! Haylings, Carlsbad, Calif.

FORTUNE Possible raising. Fishworms and crickets. Free literature. Carter Hatchery, Plains, Georgia.

ATTENTION: Typewriter owners. Make handsome profits. Write today. Groves Company, 682, Hastings 8, Nebraska.

START A profitable subscription business in spare time! We need men and women (young or old) as representatives for all leading national magazines. Liberal commissions on all subscriptions. Supplies free. Send this ad with your name and address to: Agency Bureau, Dept. PM, Hearst Magazines, 250 West 55th St., New York 19, N. Y.

EARN \$50.00 Daily making mats, shoes and mud guards from old tires. S and S Patents Inc., 1307 North Clark St., Chicago 10, Ill.

LOOKING For something informative? Home work, mail order plans, and trade magazine 25¢. Warren Co., P.O. Box 11, Glenview, Ill.

PHOTO Christmas greetings bring big profits in your spare time. Show Whitehall's fast selling Christmas greetings, everyday cards, personalized stationery, napkins, gifts. Samples on approval; 1/2 price feature offer. Make big money fast. Whitehall Studios, 396 Cleveland, Elmira, N. Y.

MEN And women wanted to start home business in spare time with little table-top rubber stamp machine. Easy to earn up to \$9.80 an hour without previous experience. Full particulars free by mail. Send postcard to Roberts, 1512 Jarvis, Room 78, Chicago 26, Ill.

MAKE Money writing short paragraphs! No tedious study. I tell you what to write, where and how to sell; and supply list of editors buying from beginners. Many small checks add up quickly. Write to sell, right away. Send for free facts. Benson Barrett, Dept. C-27-W, 7464 Clark, Chicago 26.

NEW General, religious, comedy 7"x11" signs—cost 7¢, sell 50¢. Sample free! Lowy, 612 Broadway, Dept. 941, New York City 3.

WHOLESALE Catalog! 30-80% discounts! Appliances, musical instruments, typewriters, tools, watches, jewelry, cameras, housewares, etc. Consolidated Distributors, 1300-27 Main, Clifton, New Jersey.

MAKE \$5,000 Yearly sparetime raising mink, chinchillas, nutria, etc. Free booklet reveals proved plans. Write: Furs, 588 Mt. Pleasant Road, Toronto 1, Canada.

100% PROFIT. No investment. Stamp brings details, samples. Miller, Box 584, Brooklyn 1, New York.

START Big-pay business at home in spare time. No experience needed to operate little table-top machine for bronzing baby shoes. Make \$5.48 profit on every pair. Full particulars free. Send postcard to Mason, 1512 Jarvis, Room 79, Chicago 26, Ill.

START A buying service, buy wholesale thousands nationally advertised products. Make big profits selling at sizable discounts. Postcard brings details. American Buyers, Hertel Station, Buffalo 10-D, New York.

MEN — Women! Start money-making plastic laminating business at home in spare time. Material that costs 11¢ brings back \$2.58. No canvassing or selling but mail orders bring in \$20 a day. Write for full particulars free. Rush name on postcard to Warner, Room 79, 1512 Jarvis, Chicago 26, Ill.

YOU Earn exceptional fees managing money-raising campaigns for churches, hospitals, organizations. Low cost spare time course guaranteed. Backed by 36 years experience. William Arbogast, 229 East Mason Avenue, Alexandria, Virginia.

START Identification tag business. Clearview Co., 172 Stanton St., New York City.

INCREASE Your income. Free literature. Bercher, Box 500, Shreveport, Louisiana.

NEED Products? Salesmen? Markets? Details free! Sayper Associates, 1129-C Vermont, Washington 5, D. C.

BOX Tops, wrappers, labels, etc. Sell for cash. Only 25¢ brings buying list. Lauback, P.O. Box 129, Syracuse 4, New York.

60% PROFIT Cosmetics. \$25 day up. Hire others. Samples, details. Studio Girl Hollywood, Glendale, Calif., Dept. 1269-H.

ELECTRICAL Cord repairing made easy. Amazing pocket instructions \$1.00. Free details. Marnel, Box 7642, Denver 15, Colorado.

DOLLARS Every day! Amazing new magic mail plan. Set-up free. Miller, Box 586X, Oshkosh, Wis.

NOW'S The time for getting into your own profitable weatherstrip business. E-Z-On-It, 1009 Harvard, Evanston, Ill.

"EARNING Home Profits Preserving Flowers" shows how to make money with this little known hobby method. Inquire: Mountinside, Springwater 1, New York.

TURN Sparetime into extra cash! Write today for free folder, describing interesting, home money-making opportunities! Dean Stike, R-2, Chilhowie, Virginia.

PREPARE Income tax returns at home full or spare time. \$5.00-\$10.00 per hour. Practical instructions amazingly simplified. No lessons. Particulars free. Fox Business Publications, Box 1263-A, Peoria, Ill.

GENERAL Contest Bulletin. Lists contests monthly. Sample, 25¢. 1509 1/2 East 5th, Duluth, Minn.

MAKE Money from trash. Details \$1.50. Binns, 29 North Hancock, Madison, Wis.

GUARANTEED New mailorder business. Complete information \$2.00. Royal, Box 140, Richmond 1, Virginia.

UNUSUAL Opportunity in fabulous mail-order. Delta, 2139-R Logan, Youngstown 4, Ohio.

EXPORT — IMPORT

LIMITED Number of copies Japan Trade Guide. 1956 English edition, still available. Act now! 700 pages. Published under supervision of Japanese government. Includes import-export regulations, customs, shipping, patents, etc., and 110-page directory listing 2,000 manufacturers and trading firms. Price \$10.75 postpaid—or write for brochure. Japan Trade Guide, Box 3452 Terminal Annex, Los Angeles 54, California.

IMPORT. Export mailorder opportunities. Details. Warner, Box 756, Shafter, California.

FORMULAS, PLANS, ETC.

PRODUCT Analysis, manufacturing formulas, processes developed. Moderate fees. Plastics, Box 1574, Boston 4, Mass.

NEW Window cleaner formula, \$1.00. Weko, 2024 Delaware, New Philadelphia, Ohio.

"FORTUNES In Formulas." 900 page book, over 10,000 formulas, plus catalog of chemicals mentioned, only \$4.75, postpaid anywhere. Details free. Fabian Chemical Co., 3760 St. Catherine Rd., Montreal 26, Can.

PRACTICAL Formulas. Lists free. Cummings, Chemist, Gordon Ave., Syracuse 4, N. Y.

FORMULAS: All kinds, latest, best. Literature free. Kemixal, Park Ridge, Ill.

LATE. Modern manufacturing formulas. List free. Moon Chemical, Martville, New York.

MODERN Formulas for today's fastest selling big profit products. Valuable literature free! Miller, Chemist, 1517-J, Tampa, Florida.

PLASTICS

NEW Liquid casting plastic, clear, colors. Embed real flowers, insects, photos, coins. Saw, drill, carve. Send 25¢ for handbook, "How to Cast with Liquid Plastic," and proved success plan showing how to make money at home. Castolite, Dept. K-101, Woodstock, Ill.

LAMINATING Supplies. Free price list. Solomson, 46 Cornhill, Boston 8, Mass.

PLEXIGLAS. Cut to size. Clear. Any thickness. Colors. Rods, Tubing. McClarin Plastics, P.O. Box 168H, Hanover, Penna.

LEARN Plastics fabrication for spare time income. Low cost home training now available. Write for free booklet. Interstate Training Service, Dept. D-3, Portland 13, Ore.

PLASTIC Repair kit welds breaks and cracks. Restores original finish. Complete kit \$3.00. No c.o.d. Free information. Rayther, Box 271, Station B, Toledo, Ohio.

PLASTIC Foam products. Revolutionary brand, new line. Box 25, Cudahy, Wis.

PLEXIGLAS, Fiberglass, polyester, acetate. Instructive wholesale-retail catalog free! Gem-O-Lite, 5529 Cahuenga, North Hollywood, California.

REINFORCED Plastic. Stronger than steel. Hundreds of uses. Information, six samples and wholesale catalog. 25¢. Seifert's, Box 31M, Depere, Wis.

PLEXIGLAS, Lucite. Square foot cost. 1/16", \$1.18; 1/8", \$1.52; 3/16", \$1.86; 1/4", \$2.21; 3/8", \$3.23; 1/2", \$4.36. Colors add 10%. Send 15¢ for postage. Ariatocrat Plastics, 23-25 Sussex Avenue, Newark, N. J.

NEW Liquid casting plastic, clear, colors. Embed real flowers, insects, photos, coins. Saw, drill, carve. Send 25¢ for handbook, "How to Cast with Liquid Plastic," and proved success plan showing how to make money at home. Castolite, Dept. K-101, Woodstock, Ill.

CHEMISTRY

ILLUSTRATED Catalog: Chemistry, mineralogy, biology 20¢. Tracey Laboratories, Evanston, Illinois.

CHEMICALS And apparatus for industrial, analytical, and private laboratories. Catalog 25¢. Dept. M-50, Biological Supply Co., 1176 Mt. Hope Ave., Rochester 30, N. Y.

SPECTROSCOPE For quick analysis \$3.00. Kutting, 26278 Arastadero, Los Altos, Calif.

AMAZING New Book of Science. Experiments, formulas and catalogue of laboratory supplies. Only 25¢. National Scientific Co., Dept. PM-9, 500 W. Road, Lombard, Illinois.

CHEMICALS, Glassware, catalog 25¢. Refundable. Laboratory Sales, Box 161-E, Brighton, Mass.

AGENTS WANTED

SPARE Time selling—Quick cash! Cash in on the huge demand for gifts, greeting cards, gadgets, toys, and stationery in your area. Sell world famous brands like Westinghouse through us! No experience needed. Excellent money profits from spare time sales. Send for free money making plan and big free colorful catalog now! Greetings Unlimited, 336 Park Square, St. Paul, Minn.

YOU Can make money for Christmas in spare time taking magazine renewal subscriptions. No capital or experience necessary. All supplies furnished. Write today! McGregor Magazine Agency, Dept. 500A, Mount Morris, Illinois.

GET Your share of the big profits from amazing, fast-selling Shumit. Millions will be sold. Everyone who wears shoes is your prospect. Rush your name and address for free sample offer. Anchor Sales, 11 E. Huron, Chicago 11, Ill.

ATTENTION Club chairman! Here's way to increase funds. Discover this new easy way to raise money. No risky investments 30-day credit, fast service. Sell dependable, well known name brands from America's largest assortment of greeting cards, gifts, gadgets, jewelry, toys, and personalized stationery! Send for free details and catalog. North Star, Dept. 736, St. Paul, Minn.

GOLDMINE Of 800 money makers. Copy free. Specialty Salesman Magazine, Dept. 5-B, 307 N. Michigan, Chicago 1.

START Your own business on credit. Your own boss. 1598 dealers sold \$5,000 to \$32,000 in 1955. We supply stocks, equipment on credit. 200 home necessities. Sales experience unnecessary. Pleasant, profitable business backed by world-wide industry. Write Rawleigh's, Dept. I-U-PPM, Freeport, Ill.

SEEKING New products? Get my outfit 47 money-making specialties. Latest conveniences for home, car. Send no money. Just your name. Kristee Co., Dept. 53, Akron 6, Ohio.

SELL Newest tall Christmas cards—Make 75¢ on sensational \$1.25 assortment. 250 hottest gifts, cards, stationery. 50 exclusive personalized designs. Super-roll gift wraps, 30 for \$1 box. Samples on approval, surprise offers, prompt action gift. Cardinal, 1400 State, Dept. K-79, Cincinnati 14.

CHRISTMAS Cards—144 exceptionally distinctive greetings, all with customer's name. To attract big-volume sales, line includes many cards specially designed for business firms and professional people. All popular subjects, wide price range. Unequaled in lavish treatment, unusual illustration, high-quality stock. Up to \$5 to \$100 commission on each sale. Full or part time. Experience unnecessary. Old, established firm. For complete sample kit, write Process Corp., 1950 S. Troy, Dept. MS-9, Chicago 23, Ill.

FREE Box of 21 nationally famous Christmas cards included with other fast selling assortments sent on approval. Earn \$50.00 by selling only 50 boxes of our 900 series Christmas card assortment. Can be done in a few hours of your spare time. Sunshine Art Studios, Inc., Dept. PM-9, Springfield 1, Mass.; Pasadena 1, Calif.

AMAZING New "Touch-Glow" Christmas cards sell swiftly from free samples, \$62.50 profit on 50 boxes easy! Many tall cards, stationery, novelties, album of imprints. Profits to 100% plus gift bonuses. Samples on approval. Creative, 4401 Cermak, Dept. 509-D, Chicago 23.

FREE! Beautiful leather pictures 200% profit! Apartado 9038, Mexico 1, D. F.

YOUR Own business—Used suits \$1.50, overcoats 65¢, mackinaws 35¢, shoes 12½¢, ladies coats 30¢, dresses 15¢. Enormous profits. Catalog free. Nathan Portnoy Associates, 605-AA West 12th Place, Chicago 7.

GOLD Or silver letters, numbers. Windows, doors, trucks. 1" to 8". 500% profits. Free samples. Atlas-T, 544 West 79th, Chicago 20.

PRINTING. Advertising salesmen—Excellent moneymaking sideline selling decalcomania name plates, small quantities. Automobile initials, sign letters. Free samples. Balco, XL, Boston 19, Mass.

\$1.00 PROFIT Selling \$2.95 photo enlargement deal. Allen Studio, Riegler Bldg., Little Rock, Ark.

AGENTS—300% Profit selling genuine gold window letters; stores and offices. Free samples. Metallic Sign Letter Co., 431-D North Clark, Chicago.

USED And new watches \$2 up. Free list. Southern Watches, Gray, Georgia.

YOUR Ad in this space will get some good agents for you. Yes, I'll prove it. Write for Folder "A" right now. F. W. Johnson, Classified Advertising Manager, Popular Mechanics Magazine, 200 E. Ontario St., Chicago 11, Ill.

EASY Handwork makes fast-selling articles. Sample free. Sunmade Company, Brockton 64, Massachusetts.

WANT More business? Here's an amazing opportunity to increase your sales. Talk to thousands of interested readers of "Mechanica Popular." Our Spanish Edition covers the Latin American countries like a blanket. They're real mailorder buyers. Classified rate 75¢ per word. Try an ad in our next issue. Classified Advertising Department, Popular Mechanics Magazine, 200 East Ontario Street, Chicago 11, Ill.

CALIFORNIA Sweet smelling beads. Sensational sellers. Particulars free. Mission, 2328-PM W. Pico, Los Angeles 6, California.

RUN Spare-time greeting card and gift shop at home. Show friends samples of our new 1956 Christmas and all-occasion greeting cards and gifts. Take their orders and earn to 100% profit. No experience necessary. Costs nothing to try. Write today for samples on approval. Regal Greetings, Dept. 89, Ferndale, Mich.

TREMENDOUS Profits! Every man, woman and child a customer. Used suits \$1.50, pants 35¢, dresses 20¢, shoes 20¢. Operate from store, home, car. Free catalog. Superior, 1250-A Jefferson, Chicago 7.

FAST Selling money makers! Metallic ironing board cover; purse-shopping bag; many others including \$1 retailers. Quality Products, Dept. A, Box 748, Passaic, N. J.

REDUCING Machines. Factory agents. 100% profit. Exclusive. Mary-Mac, 1012 Powhattan, Dallas 2, Texas.

AT Last! Something new and sensational in latest tall Christmas cards. Make extra money fast! Show satins, velours, metallics. Gets easy orders. Pays up to 100% profit. 30 free samples. With name 50 for \$1.50. Big line. Amazing convertible pen-pencil, napkins, gifts, stationery. Several \$1.00 boxes on approval. Puro Greetings, 2801 Locust, Dept. 640-L, St. Louis 12, Mo.

WHOLESALE Catalog! 30-80% discounts! Appliances, musical instruments, typewriters, tools, watches, jewelry, cameras, housewares, etc. Consolidated Distributors, 1300-10 Main, Clifton, New Jersey.

NEW Invention, \$4.95 fire alarm, paying up to \$1,100 a month. No wiring. Unlimited market. Dramatic demonstration. Free kit. Merlite (Alarm Div.), 114 E. 32nd St., Dept. F-53L, New York 16, N. Y.

BIGGEST Christmas card profits. Sensational "Super-36" assortment pays \$1.25 profit on every box—\$50.00 on 40 boxes easy. 200 fast sellers double earnings! Tall cards, novelties, stationery, bargain specials. Assortments on approval. Color catalog. Personalized album free. Midwest, 1113 Washington, Dept. 494-S, St. Louis 1, Mo.

MAKE \$100 Weekly selling stainless kitchenware. Details free. Write, Conklin, Box 12, Ontario, Calif.

IF You want to earn money fast, I'll send you free sample stocking of newest stretch DuPont nylons to sell at only \$1 a pair. American Mills, Dept. 497, Indianapolis 7, Ind.

BUY Wholesale thousands nationally advertised products at big discount. Free "Wholesale Plan." American Buyers, Hertel Station, Buffalo 16-A, N. Y.

ENJOY Sparetime profits servicing new and renewal magazine subscriptions for friends, neighbors, organizations. No experience. No investment. Free catalog, supplies. Complete information. National Publications Company, Dept. P1, 4055 Wilshire Blvd., Los Angeles, Calif.

LET Us send you for free trial everything needed to make extra money. Show friends amazing value Christmas, all occasion greeting card assortments. Profits to 100%. Bonus. Write for feature boxes on approval, 74 free samples personal Christmas cards, stationery. New England Art Publishers, North Abington 933-D, Mass.

MAKE Extra money—With newest Christmas card assortments. 21-card \$1.00, \$1.25, \$1.50 "tall-slim" Christmas, all occasion, religious assortments, gift wrappings, gifts, novelties, imprinted Christmas cards. Experience unnecessary. Profits to 100% plus cash bonus. Write for samples on approval, free \$1.00 gift offer, catalog, selling plan. Hedenkamp, 361 Broadway, Dept. PM-44, New York City.

NEW Home club plan sensation! Style shows, children's, adults' apparel easily earns \$20.00-\$40.00 evenings. Prizes, gifts, fun! Experience unnecessary. Complete outfit furnished. BeeLine Fashions, Bensenville 613, Illinois.

EXTRA Cash in your spare time. No experience needed. Just show superb Elmira Christmas cards, name imprinted. Samples on approval. Bonus: Free box of cards; also 50% profit on first order. Elmira Greeting Card Co., 291 Clinton, Elmira, N. Y.

\$1,000.00 A Month for making dramatic 3-second demonstration of amazing lightweight Presto fire extinguisher. New chemical used by airforce snuffs out fires instantly. Only \$4.95. Terrific commissions. Millions want it. Free kit. Merlite, 114 E. 32nd, Dept. F-53L, New York City 16.

EASIEST \$65 You'll ever make! Show amazing "Magic-Lustre" Christmas cards. 65 boxes pay \$65. Personalized cards 25 for \$1. Assortments on approval, free sample book. "Southern Belle" doll free for promptness. Southern, 478 N. Hollywood, Dept. M-63, Memphis 12, Tenn.

DRYCLEANS Clothing for only 10¢ per garment. Lightning seller. Saves dry-cleaning bills. Samples sent on trial. Kristee Co., Dept. 54, Akron 8, Ohio.

BIG Money-making opportunity. Exclusive line work uniforms. Jackets, pants, shirts, coveralls. Advertising embroidered. Every business prospect. Outfit free. Master Co., 421 Water, Ligonier, Ind.

OVER 100% Profit. Ingenious imported needle threading machine. Sells on sight. Send 50¢ for sample and money making details. Atlantic Import, 1302 Cadillac Tower, Detroit 26, Mich.

"BABY Sitter." Amazing new invention. Works through radio. No wires. No installation. Sample demonstration. Make fast sales. Pays wonderful profit. Exclusive territory to live-wires. Write, Accurate Communications Equipment Corp., 520 Fifth Ave., New York 36, New York.

MEN. Money! Miracle Glass tint tints windshield. Gives marvelous glare-proof protection, plus 1956 look. Sprays on in jiffy. Reduces glare from sun, headlights. Lasts for years. Auto, truck owners buy on sight. Profits 100% up. Rush postcard for free details. Glass tint, 220 S. State, Dept. PM-9, Chicago.

MEN-Women agents. Sensational new money-makers — Beautifully hand-painted, plastic personalized photo enlargements, compacts, rings, bracelets, lockets, etc. Simply take orders, pocket 40% commission. We deliver and collect. Sales outfit free. Novelco, 3343 North Avenue, Chicago 47.

COUNTRY Salesmen. Automatic fire extinguisher. Huge profits. Out-O-Matic Co., 1737 E. 31st, Denver, Colorado.

MEN, Women, make money spare time plus new car as bonus for encouragement. Amazing hosiery guaranteed to wear without holes, snags, and runs, or replaced free. For example, lovely 60 gauge nylons guaranteed for as long as 1½ years, or replaced free. Write Wilknit, 1769 Wash., Greenfield, Ohio.

GOLF Balls. Complete line. Easy to sell. Repeat business. Good profit. Goller's Ruff, Lynbrook, N. Y.

MEXICAN Feather pictures. Big profits. Sample 15¢ stamps. Juansosa, Soledad 45-13, Mexico City.

SPONGERASEN Whisks bugs off windshield. Cleans car, windows. Gas stations buy quantities. Sample 50¢. Babcock, Box 551-P, Scottsdale, Arizona.

NEW Design 7½"x14" signs, stores, taverns, gas stations, comedy and Christmas—35¢ to \$2.00 sellers. \$1.00 samples. Free literature. Full or spare time. Sho-Card Signs, Prattville, New York.

TREMENDOUS Profits! Amazing new Magic — Removes rust stains instantly from fabric, porcelain, chrome, metal. Rush 50¢ for sample tube, demonstrator cloth and money-making details. Fred Pedersen, 156 Grove, Berrien Springs 12, Michigan.

NEED Money? \$50 yours. Sell only 100 boxes new Christmas cards. Other amazing offers. Free samples imprinted cards. Feature box assortments on approval; free catalog. 100 profitable items. Work with a national leader. Write today. Pen-N-Brush, Dept. PM-9, 139 Duane Street, New York City 13.

60% PROFIT Cosmetics. \$25 day up. Hire others. Samples, details. Studio Girl Hollywood, Glendale, Calif., Dept. 1269-H.

FOAM-O-Cell sponge, new miracle household item; cleans rugs, carpets, upholstery like new! Tremendous market, fast \$1.00 seller, big profits. Free details. M & M, Dept. 4-PM, 842 Third Avenue, New York City 22.

NAMEPLATES. Desk signs. Free samples. Biggest profits. Whitney Signs, West Springfield, Massachusetts.

SELL Profitable personalized rugs. For information write Bobby's, Department 18, Manitou Springs, Colorado.

SCHOOL Seniors—Be popular with classmates. Have spending money galore. Details free. Craftcards, Box 235-L, Pittsburgh 19, Pennsylvania.

FANTASTIC New money-making plan. Sell nothing, yet make to \$50 daily! Offer women, personally or by mail, beautiful stainless steel tableware set complete with chest, free for selling just two sets to friends. Exclusive patterns not obtainable elsewhere. Guaranteed 50 years. Can't rust, stain or tarnish. Successor to sterling. Amazing low wholesale cost starting at \$2.70 set. Postcard brings catalog, booklet "How To Make Money in Your Own Business," all money-making plans absolutely free. Topval Corp., Lindenhurst 61, N. Y.

BIG Profits! Sell amazing Seal-Tite puncture-proofing compound to car owners, cab and truck fleets, service stations, etc. Terrific appeal, fast \$1.98 seller! Free details. M & M, Dept. 2-PM, 842 Third Avenue, New York City 22.

SELL Wholesale to hardware, groceries, plumbers. Retail to consumer. New Septic-clean for septic tanks. Large profits. Septicclean, 2870 Coolidge, Berkeley, Mich.

BIG Profits! Easy to sell beautiful hand painted portraits, made from any snapshot or negative. Details. H. Shultz Co., Box 44-747, Sta. H, Los Angeles, Calif.

BUY IT WHOLESALE

WHOLESALE Catalog! 30-80% discounts! Appliances, musical instruments, typewriters, tools, watches, jewelry, cameras, housewares, etc. Consolidated Distributors, 1300-20 Main, Clifton, New Jersey.

FREE Gift catalog. Wholesale catalogs, name brands. Edith's, Deep River, Conn.

WHOLESALE Catalog. 100 pages, \$1.00 refundable. Conklin, Box 12, Ontario, California.

USED And new watches \$2 up. Free list. Southern Watches, Gray, Georgia.

BUY Wholesale! Nationally known brands. Catalog \$1.00. D'Auria, Box 355-PM, Jackson, Michigan.

BARGAINS, Joblots, closeouts. 2000 items. Tremendous savings, clothing, toys, gifts, jewelry, television, etc. 25¢ brings wholesale catalog. \$1.00 merchandise certificate included free. Reliable Jobbing, 311-B North Desplaines, Chicago.

WHOLESALE Catalog 75¢ jewelry, watches, appliances. Riddy Sale Co., 16218 Shiloh Rd., Cleveland 10, Ohio.

ELECTRIC Guitars, amplifiers, wholesale. Free catalog. Carvin, PM287, Covina, Calif.

WHOLESALE Catalog! Jewelry; houseware; appliances! Postcard! Midwest, B-156-M, Pontiac, Ill.

FREE! Illustrated wholesale catalog. Save and earn money on over 1000 most popular, brand-name housewares and appliances. Tremendous discounts. Write: Shop Smart Ltd., Dept. 19, Box 687, Newark 1, N. J.

WHOLESALE Catalog! Appliances, cameras, watches. Postcard. Selbyco, Decatur 160, Illinois.

YOUR Cost as little as 30¢ on dollar! Household items needed in every home. Sell direct, by mail or to agents. Postcard brings booklet "How To Make Money in Your Own Business," catalog and money-making plans absolutely free. Topval Corp., Lindenhurst 624, N. Y.

SALESMEN—DISTRIBUTORS

SALESMEN: For fast selling imported merchandise, 40% commission. Write for free information. Box 4082, Corpus Christi, Texas.

USED And new watches \$2 up. Free list. Southern Watches, Gray, Georgia.

NEW Jobs open in selling! Send name, address for five free issues of Opportunity Magazine's money-making guide, listing hundreds of companies who'll pay you well, full or part-time. No experience needed. Opportunity, 850 N. Dearborn, Dept. 17, Chicago 40, Ill.

BUILD Sales by recruiting productive distributors selling direct or to retail outlets. Secure most concentrated circulation through classified columns of Salesman's Opportunity. Write for facts. Gilbert, Salesman's Opportunity, Room 1700, 850 N. Dearborn, Chicago 10.

GOOD Man can make \$3,000.00 next 90 days. Every house in town wants amazing NLite "cat's-eye" lawn sign. Automatic selling plan pays profits everyday. Write today for free details. NLite, 173 W. Madison, Dept. 301, Chicago.

ADD \$20.00 To \$200.00 per week to your income with Miracle Bowls! Sell door to door and store to store. Just add water and watch them grow. Write for free literature now. Miracle Bowls, Dept. 3, Littleton, Colorado.

INTRODUCING Fast selling patented close quarter saw, factory to you. Retail \$1.00. Diesel Power Inc., Greenville, Penna.

SALESMEN Wanted. Make money in oil. Complete line lubricants including nationally acclaimed motor conditioner that increases gasoline mileage 33%. Free sample kit. Revere, Box 1886, Cleveland 6, Ohio.

BUSINESS Kit free! Postcard puts you in business! Complete line. 190 shoe styles, also jackets. New discoveries pay big commissions. No investment. Send for free kit. Mason Shoe, C34, Chippewa Falls, Wisc.

GET New shirt outfit free: Make \$90.00 weekly on 5 average orders a day. Famous quality made-to-measure dress and sport shirts at \$3.95 up sell fast to all men. No experience needed. Full or part time. Write: Packard Shirt Co., Dept. 301, Terre Haute, Ind.

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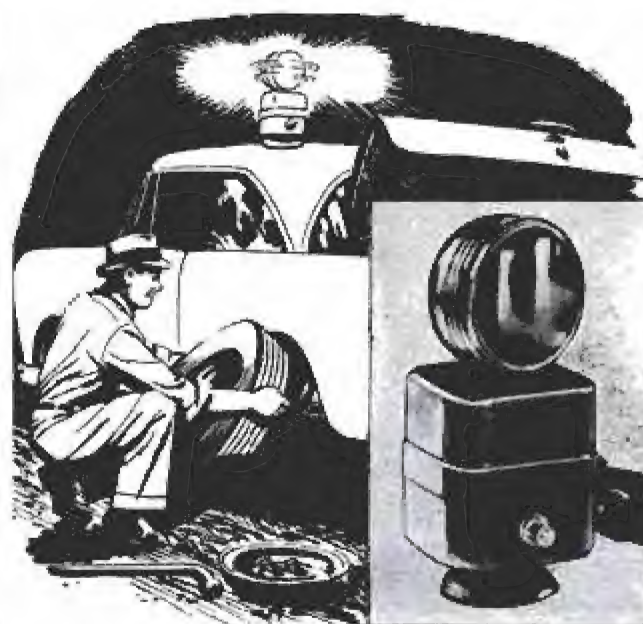
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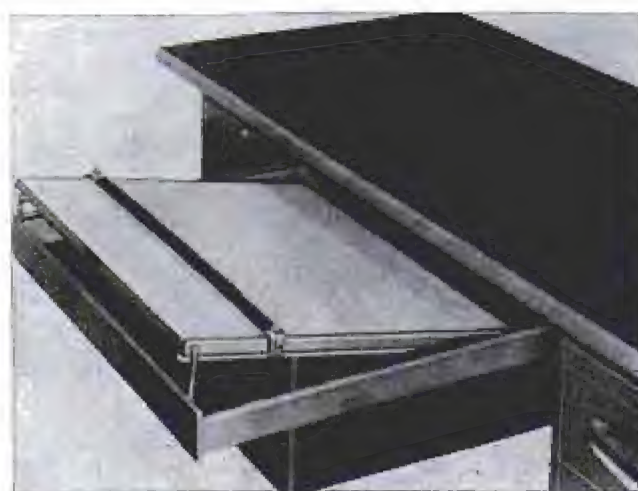
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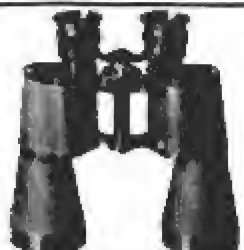
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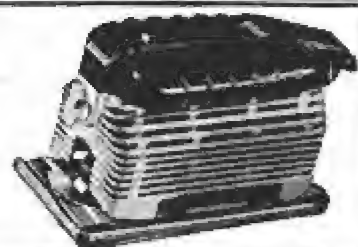
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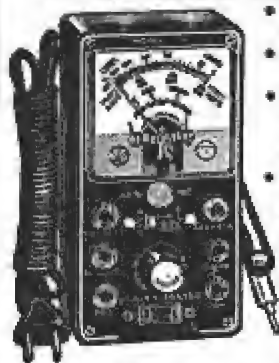
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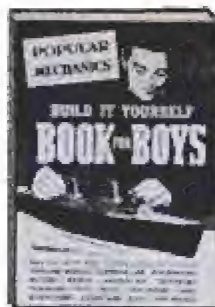
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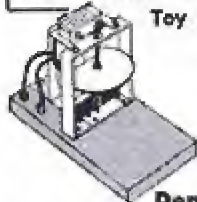
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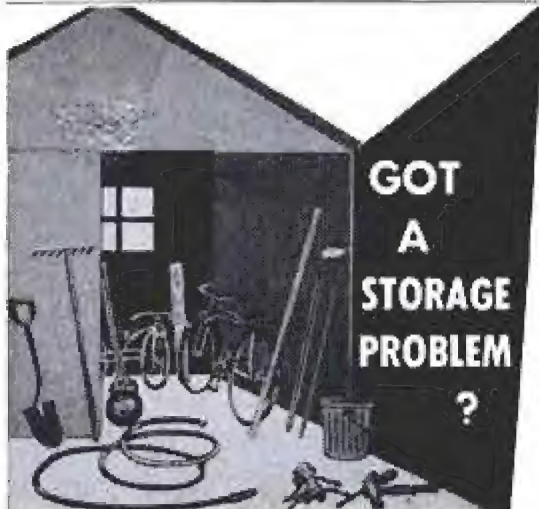
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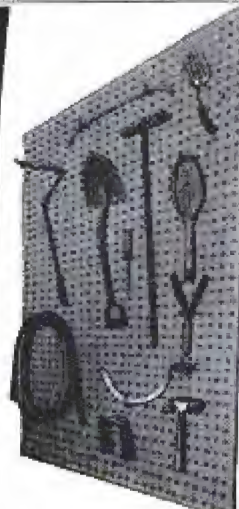
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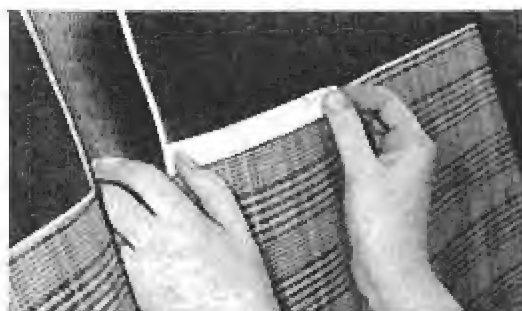
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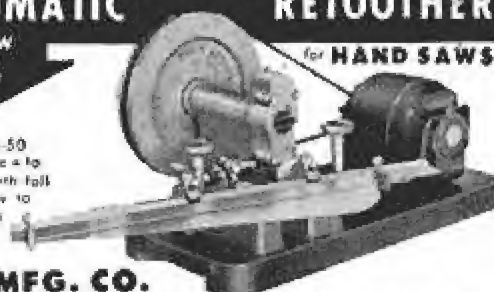
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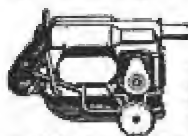
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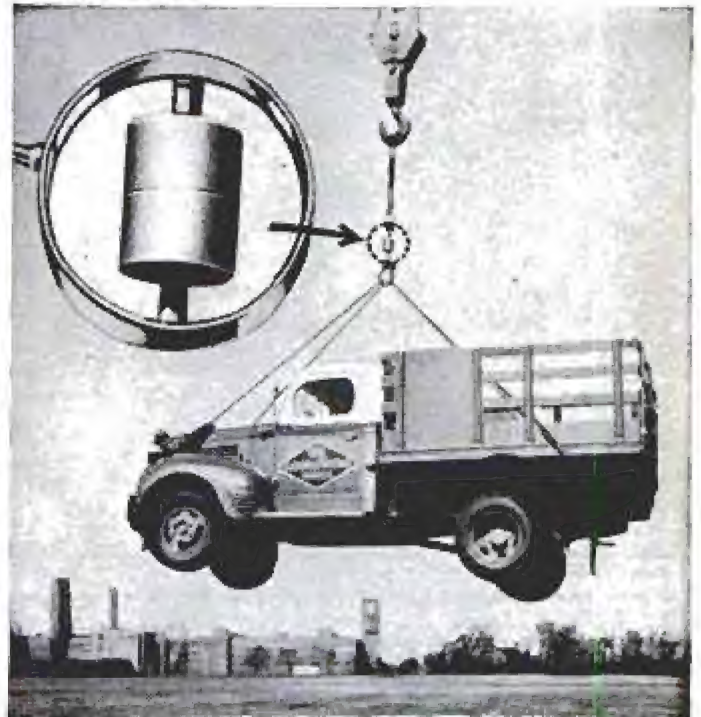
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TO PARENTS, electronics may mean their television set or maybe some of those Wall Street stocks they want for nest eggs. To college kids, it now means plug-in aids to make learning easier, as well as automation that flunks them if they can't make the grade.

The trend is especially noticeable at highly electrified Cornell University which even has an electronic warehouse full of parts for "do it yourself" professors who want to rig up their own peculiar contraptions. But it's appearing on most large campuses to guide students in their play and spark up their work with push-button pedagogy. Nor is it only for science courses.

For example, Cornell was first to switch over on a big scale to electronic help in making those foreign languages easier to take. Native speakers—tape-recorded—do a big share of the teaching.

This means a student can play the tape back, over and over, for full flavor of the new tongue. He can tape-record himself, then, with oscilloscope, check on his own accent in Spanish, or maybe Vietnamese. Its wavy speech-frequency lines, far more reliable than listening or watching your lips in a mirror, allow you to "see" exactly what you say.

For those who get past Cornell's calculating machines with passing records, even commencement isn't the same any more, though still held in Drill Hall, a building so large that it's only one third filled by a basketball crowd of 9000. The most important personality at graduation exercises used to be Prof. C. L. ("Bull") Durham, with a slight physique but remarkably booming voice that made him the only man fit to master the ceremonies.

Today, it's a much more showy ceremony although run by a man nobody sees—quiet-voiced Arthur Stallman hidden by

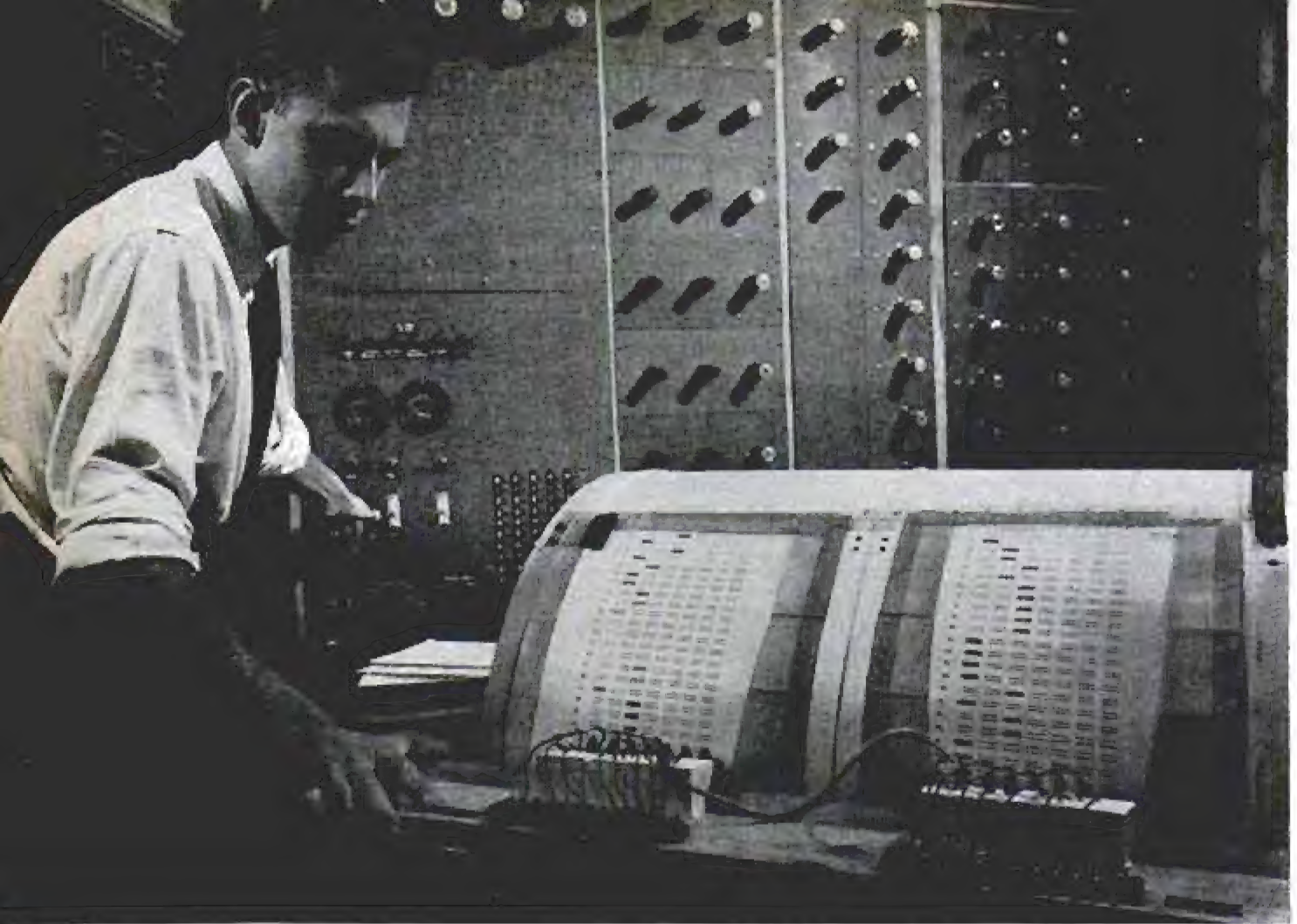
By William Gilman

POPULAR SEPTEMBER 1956 MECHANICS

WRITTEN SO YOU CAN UNDERSTAND IT
VOL. 106 NO. 3

Electrons Join the College Faculty





Electronic profile analyzing computer (EPAC) solves complicated problem and shows answer in neon lights

Student in Electron Microscope Laboratory uses new instrument to see things 50 times smaller than under light microscope



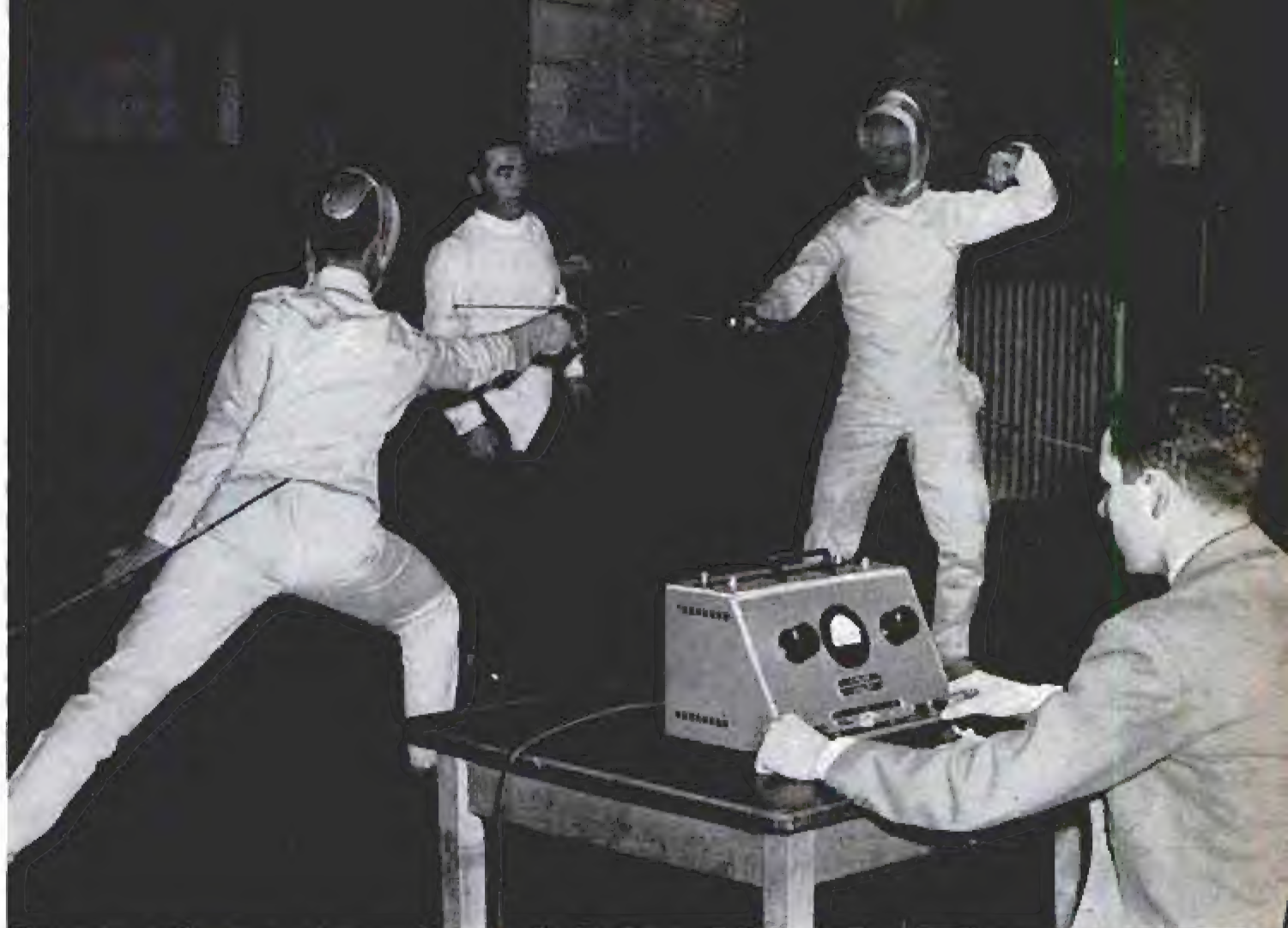
banks of flowers below the stage. With an intricate system of pickups and amplifiers feeding into the little black box before him, he puts on a program frankly designed to give parents and their graduating offspring tears in the eyes.

Stallman's push buttons send the cues that weave a program of taped binaural organ music with live glee club and concert band, that limit the main speaker's oratory to 11 minutes, and march 1700 candidates for diplomas past in an hour.

But biggest change is in day-to-day activities. All over the campus—not just among budding physicists like those using an electron microscope to see how molecules line up—are pedagogic devices that make learning more accurate as well as easier.

For example, the tape recorder can be as helpful in teaching the classics of literature as in music, or in being the "hearing aid" with which young biologists learn the songs of birds or bellows of crocodiles.

Take something as domestic as home economics. Just when is lemon meringue too runny? Even the same



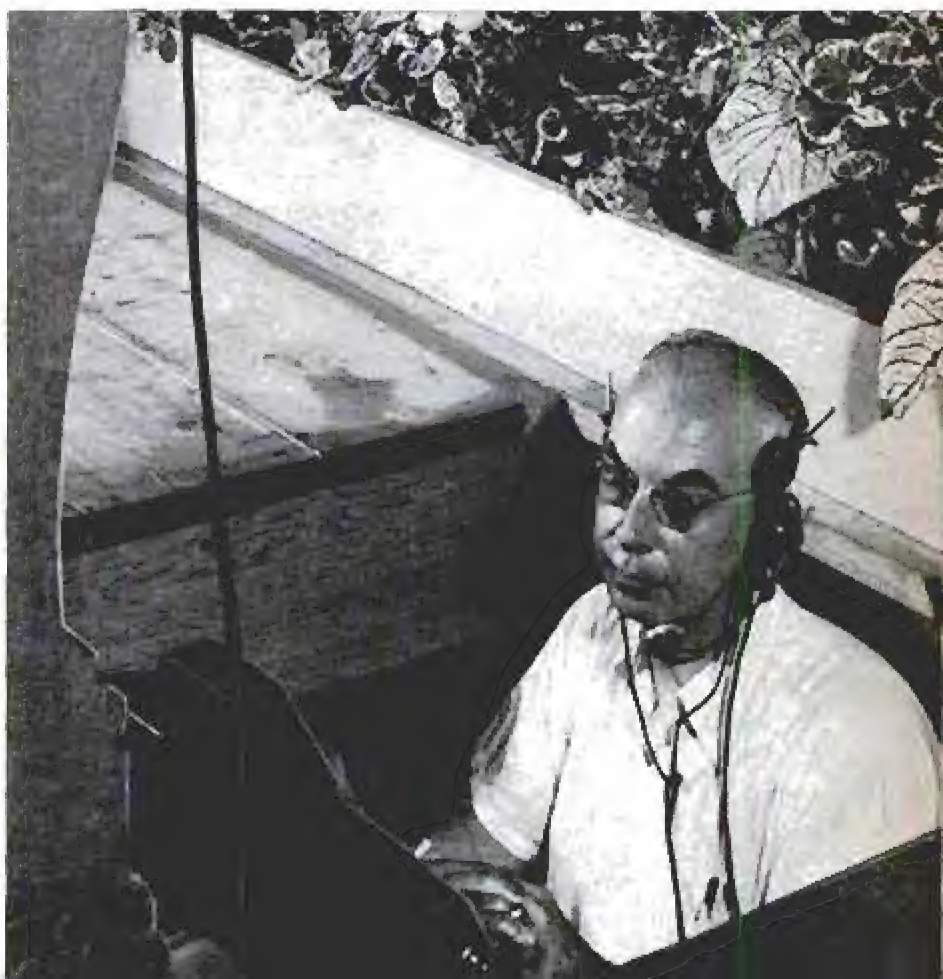
Fencers wield electrified epees. A hit by either registers by light and buzzer on the electric recorder

cook might not agree with herself from day to day. For showing meringue how-to, Mrs. Shirley Felt's "pie tilter" was homemade with parts from the electronics supply. It's motorized so it will tilt to an angle of 90 degrees in one minute, and an arrow pointer records where the meringue starts slipping off the pie's filling.

A Fad-Ometer shows color changes in textiles; it contains a "sun" of its own which in a few hours produces as much fading as weeks of ordinary sunlight. With a "moisture meter" reporting on ripeness of something like sweet corn, there's no need to punch the corn's kernels with your thumb-nail. Another electronic gadget called color-meter has dials telling when the sweet potato is a correct yellow or when potato chips are the right shade and thus properly done.

Most science courses are well suited to electronics' teaching aids. How to perform a Caesarean operation on a ewe, in veterinary medicine? Watch the professor over closed-circuit TV. When, in

Colorful commencement program at Cornell is run from this flower-hidden pit. Controller Arthur Stallman electronically builds program of band music, speakers, glee club, tape-recorded organ





Above, manager Tito Capogrossi of the Cornell Electronics Stores, a warehouse crammed with equipment, pushes remote-control switch to operate samples on display panel. Below, in the home Economics Department, shade of potato chip is tested on electronic color meter



agriculture, is a hog too fat? With the "lean meter," there's no more need to poke the creature's ribs hit-or-miss. Four flashlight batteries power an electrode needle which shows fat and lean areas with simple accuracy—fat is a poor conductor of current.

In physics, what's the "Brownian movement" and how can this microscopic badminton game be seen by a few dozen students simultaneously?

"It used to be I'd set up the experiment with a microscope," says Prof. Guy E. Grantham. "Then I'd ask the students to please stop by, just for a minute in their free time, and take a look."

Now Grantham has captured his audience with two 21-inch TV sets in a closed circuit showing confined to the classroom. While Grantham is explaining, he's focusing the TV camera down the microscope barrel.

It was higher education which explored electronics in the first place—for industrial and war uses. Now it's figuring out meters and blinking lights for college courses—and for the extra-curricular "fun" departments of a modern campus.

At big athletic events, the public-address system is now as standard as the school band, and electrons work in smaller sports, too. Last year, the coxswain of the varsity crew was given an electronic megaphone so bellowing at the crew would be easier on his throat.

The once-dying sport of fencing has bounced back with new life thanks to electronic refereeing. You can still challenge the umpire in baseball, but not in fencing.

With foils, for example, it's foul if you hit above the opponent's shoulders or below a groin line. So a fencer now wears metallic cloth over the target area. Colleges have adopted the foil invented by Coach Bela De Tuscon of Wayne University. It's hollow steel, like a casting rod, but with wires inside, and the fencer wears a battery in his pocket. When he scores a hit, a bulb atop his mask lights up.



In the mechanical engineering school, with electronic help students study motion used on assembly line

Another version has a yellow light for foul, red for fair.

With the epee—the famed “dueling sword”—the entire body is fair target, and first hit is the main thing. But who scores first in the split seconds of an exchange?

The epee's safety tip has three small prongs. Judges used to look for the blade to bend at a hit. Then a red fluid was used to leave its telltale mark. But judges might take five minutes looking for a red spot on the fencing jacket. All this became so tedious that when the epee events came on at a fencing meet, spectators started drifting home.

That's all changed. Like its opponents, Cornell coach Georges Cointe's team used electrified epees last year in winning the national intercollegiate team championship.

Here, the epee has a tiny button at its tip. The slightest pressure closes a circuit between two fine wires running down inside one of the weapon's grooves. There's a plug-in at the sword's hand guard (with a grounding connection in case you hit the other's hand guard). From your hand guard, a cable runs up your sleeve to another plug at the back of your belt. Here, the main cable is connected. It runs off a

(Continued to page 266)

Mrs. Shirley Felt tests lemon meringue pie on electric pie tilter, to see that meringue isn't runny



Guy E. Grantham, professor of physics, delivers lecture to his class over closed-circuit television





Connecting Link Repairs Chain

Requiring only a hammer for installation, a rugged but simple connecting link has been designed for repairing broken chains. Its manufacturers say one man can make the repair in five minutes right on the job. The connecting link consists of two interlocking halves, held together by two oval pins, which are in turn held by a U-shaped key pin.

Repair on a broken chain can be made in five minutes with simple connecting link. Only tool required is a hammer to drive in oval and key pins

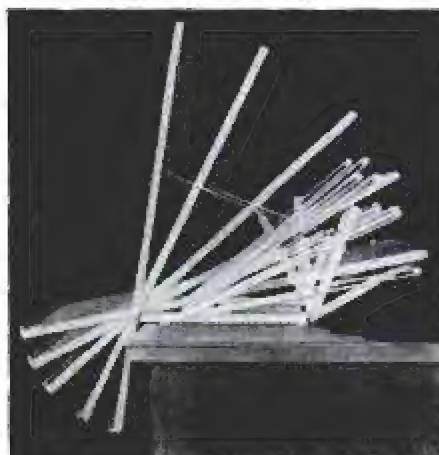
Put-Together Igloo For Small Eskimos

Little Eskimos can plan an imaginary polar-bear hunt in an igloo they construct themselves. Interlocking parts for the igloo are made of heavy-duty corrugated board. The structure stands 40 inches high and is 6 feet in diameter. It can be taken apart and stored in a small box when not in use.

Parts, made of heavy-duty corrugated board, have locking tabs. The igloo is 40 inches high—just right for small Eskimos



Folding Drawing Easel Locks Into Hundreds of Positions



You can lock a new folding drawing easel into hundreds of positions. Quickly adjusted from the horizontal to the vertical or any position in between, it is designed for drafting, general drawing, painting and sketching. Used on a desk or drawing table, it has a wide base to counterbalance the tilting top and prevent its toppling over.

"Brain" Turns Plan Into Finished Part

With a new automatic machine, blueprints are turned into finished parts without human manual labor. The machine, developed by Bendix Aviation Research Laboratories, will accomplish in from two to four hours a technical operation which previously required 400 man-hours. Information from the blueprint is punched onto a plastic tape. The tape then is fed through an electronic control unit which directs servomechanisms to make the proper cuts with a machine tool.

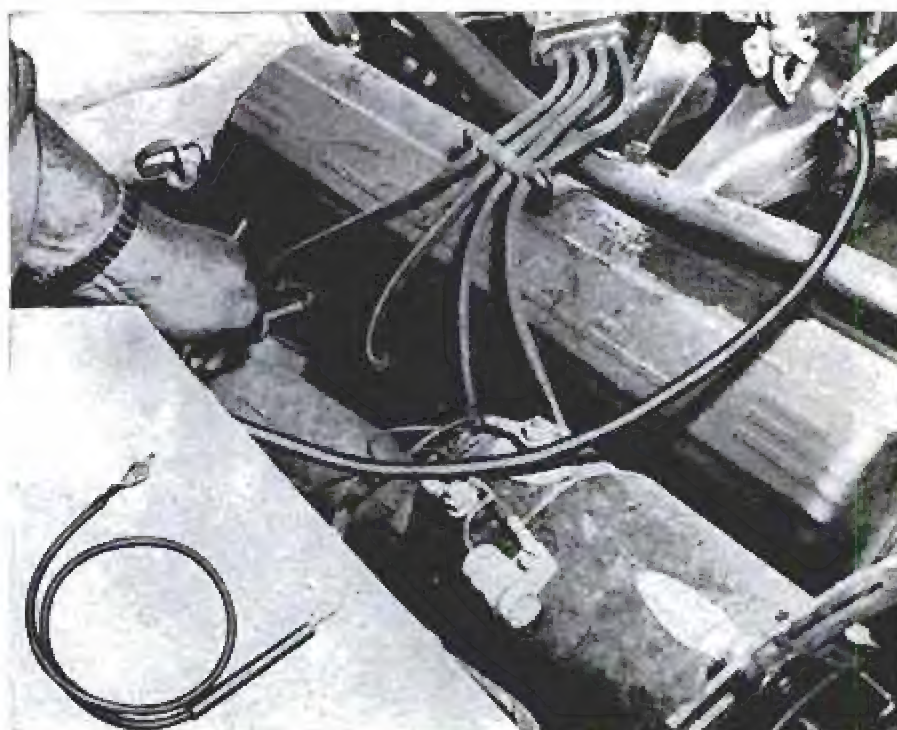


Power Digger

Much of the hand digging once needed for small excavations is now done by portable powered diggers attached to tractors and trucks. With one of these, one man can do the work of 12. The machine can travel from job to job and digs to a depth of 10 feet below grade. One operator reports that he can dig 130 feet of ditch, 2 feet deep and 20 inches wide, in 30 minutes.

Needle Point Checks Plugs

Mechanics are able to check hard-to-reach spark plugs and ignition wiring more quickly with a needle-pointed test device. The needle is attached to an insulated handle on one end of a length of high-tension wire. On the other end is a positive ground clip. The test device eliminates fumbling around hot engines to disconnect wiring and remove the protective covers common on today's engines. The needle itself is about an inch long and the test wire is about 30 inches long.





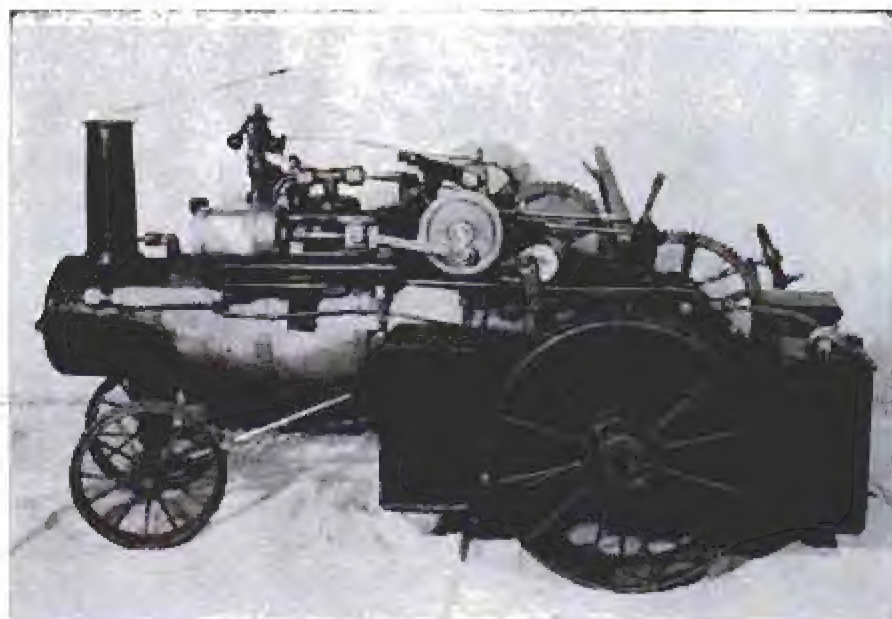
Pulverizer Chops up Vines

Potato vines are no problem on the farm of William Gehring of Rensselaer, Ind. A pulverizer built on the farm moves across the field ahead of the digger. It is set just deep enough to catch the vines, which then pass up through the pulverizer and are ejected through one of two spouts, depending upon the direction of the wind.

Implement precedes digger, can be set just deep enough to catch the vines

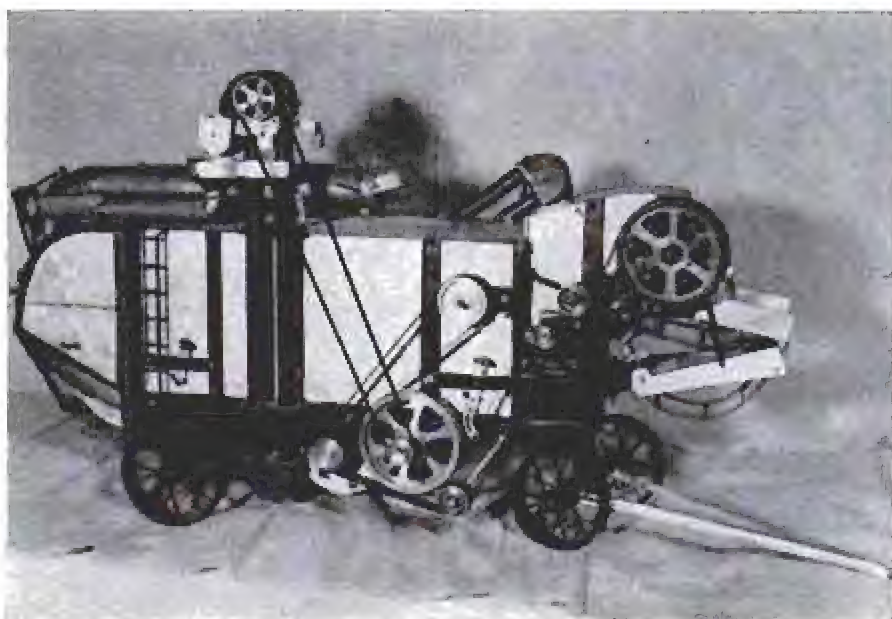
Model Steam Engine Puffs and Separator Threshes Grain

Nine years ago, Lawrence D. Graham of Camrose, Alberta, started to build a model of an old-time steam engine. Today he has finished not only the engine, but a model grain separator as well. Both models are amazingly realistic, yet the engine was constructed from memory and the separator from only a newspaper photograph. The grain separator, which will actually thresh grain and blow straw and chaff through a blower, stands 17 inches high and is $4\frac{1}{2}$ feet long. The steam engine is two feet long and really works, though for display purposes it usually is operated on compressed air.



Morse-Code Typewriter

Wireless operators can typewrite Morse code to other stations on the keyboard of a sender invented by Leif Evensen of Larvik, Norway. When a key on the unit is hit, the impulse is converted to Morse code and transmitted by radio at the rate of 240 units per minute.



Soon to emerge from secrecy in a Texas aircraft plant is the first of the delta-winged bombers, shown on this month's cover. From the interceptor to the B-58 and the atom bomber, this is the



ERA OF THE FLYING TRIANGLES

By
Thomas E. Stimson, Jr.

THE DELTA CHASE PLANE was just getting off the ground at Palmdale almost 150 miles away when Bob Myrann climbed into the new F-102A at San Diego, Calif., and started his cockpit check.

All the instruments checked out and Myrann got his engine started. By then the chase plane was calling him.

"787, this is Rex Warden in 995. I'm just passing Santa Anita race track. You all ready to roll? Over."

"Okay, okay, 995, let's go!" Myrann responded. He taxied out to the far end of the runway, got his take-off clearance and ran the turbine up to full military power. Then he released the brakes and cut in the afterburner. The plane howled down the runway, flared off the concrete, and Myrann pulled it up in a steep climb that would have stalled a piston-engine fighter.

Meanwhile Warden was getting into position. He had flashed across Orange County, started letting down over Escondido, Calif., and had made a big sweep of San Diego. By the time Myrann was airborne, Warden was right on his tail.

Sending a delta chase plane to accompany another delta isn't done every day, but the incident makes a graphic

Hottest of present operational fighters is the delta-winged F-102A, pictured above as its landing gear is retracted after take-off. Below, tail view of the F-102A shows extended speed brakes just above jet outlet. A drag chute is also used to slow plane for landing



demonstration of how fast the new supersonic interceptors can fly. Warden had taken off from Palmdale and reached San Diego in the same time Myrann needed for a cockpit check and a normal take-off.

The deltas are a new family of aircraft. They get their name from the fourth letter of the Greek alphabet, an equilateral triangle, that the new shape somewhat resembles. The delta has been called the wing of the future for aircraft that fly faster than sound. It isn't very efficient at slow speeds, but it goes through Mach 1 with hardly a tremor—then it's hard to catch. Many designers believe that its margin of superiority widens rapidly as the speed goes up. It is said to be more stable and maneuverable than other designs at high altitudes.

"The delta wing gives an interceptor pilot a tremendous advantage at altitudes of around 50,000 feet," says Warden, chief test pilot at Convair's Palmdale, Calif., facility. "A delta can overtake any bomber that has been built so far. If the bomber pilot tries a tight turn in the thin air he loses speed and goes into a stall. He needs maybe 25 miles of space to turn around. The delta can turn much more sharply. If the bomber pilot tries to dive away, his speed goes up and he gets into compressibility. He loses control. Escape is almost impossible."

These days the F-102A doesn't even need to get close to its target to make a kill. The big six-foot Falcon homing missiles that it carries can be fired from miles away. Interception is automatic and is performed by the new Hughes "seek-find-kill" electronic system that guides the interceptor to the target. If air-to-air aimed rockets are to be fired instead of the guided missiles, the electrical brain "locks on" the target and gives steering directions to the pilot so that he flies a lead collision course. Then the system opens the missile doors under the fuselage and launches the armament at the exact instant when a kill is assured.

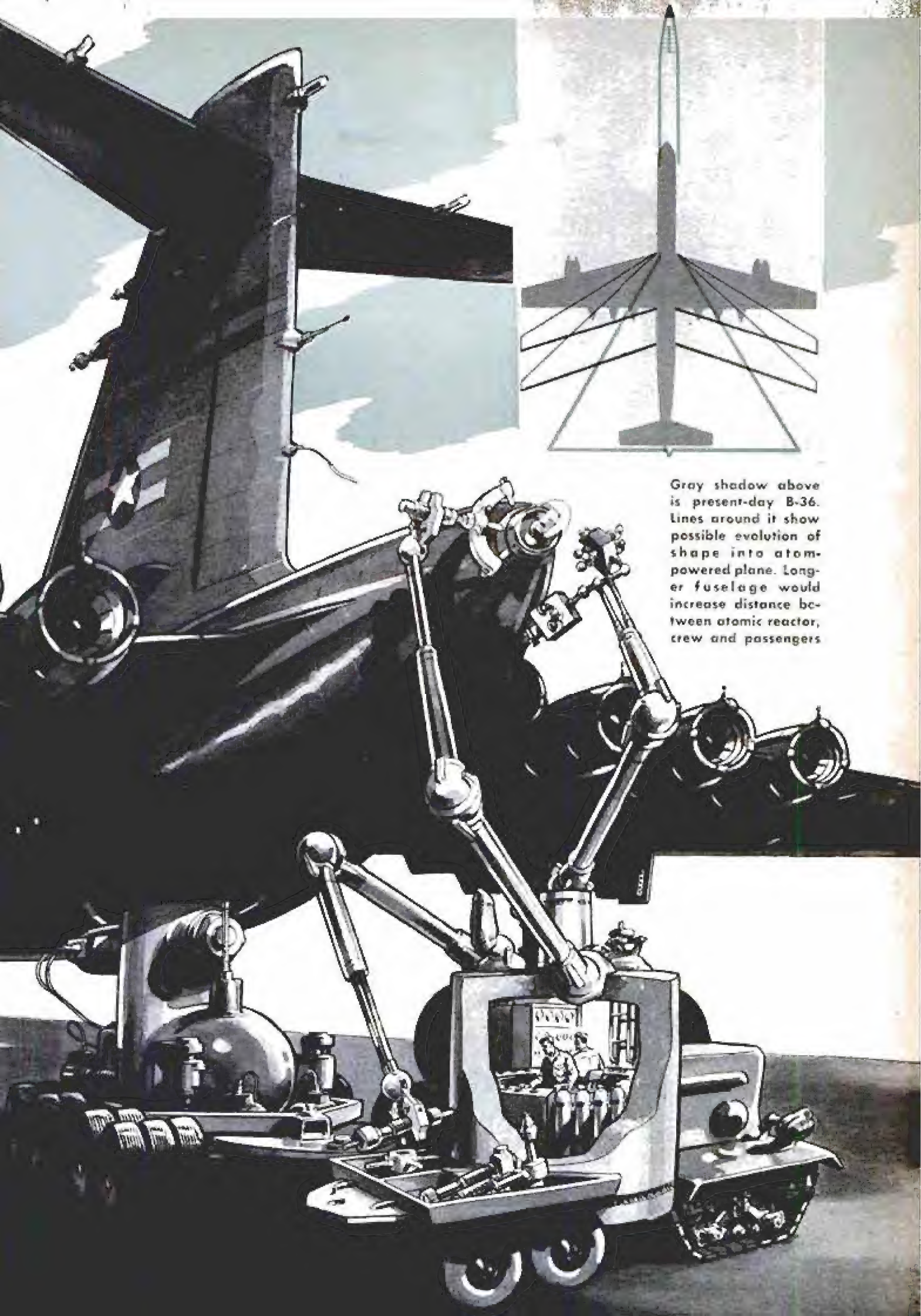
The delta configuration has so many advantages that England, Sweden, France and Russia, among others, are building delta aircraft. In the United States, Douglas is using a deltalike shape for its F4D Skyray and again for its A4D Skyhawk. Ryan Aeronautical selected the delta wing for its new X-13 Vertijet aircraft that takes off straight up. Other deltas are on the way.

The real exponent of the aircraft that is shaped like an arrowhead, however, is Convair, builder of the F-102A. Convair used the wing for its Sea Dart seaplane and also for its XFY-1, the turboprop fighter that takes off and lands on its tail. The Convair designers in San Diego regard it as the logical shape for tomorrow's planes

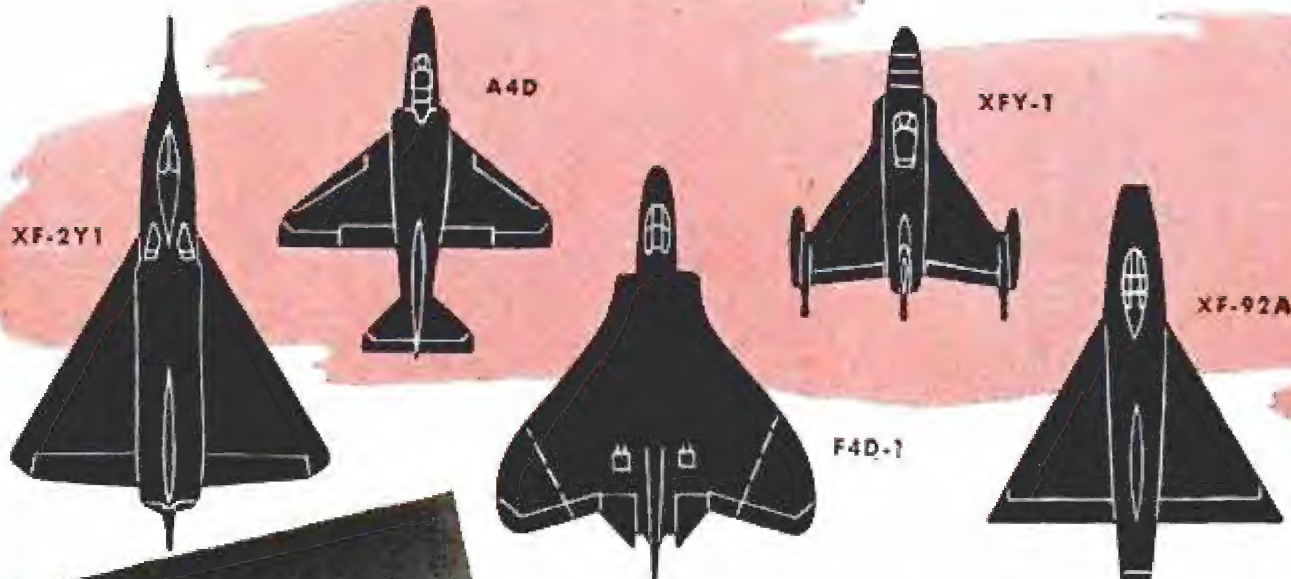
Popular Mechanics' drawing made from designs by Lee A. Ohlinger of Northrop Aviation, Inc.

Giant delta-winged, atom-powered jet transport of the future will be refueled by lead-shielded tank-like vehicles. Operators inside vehicles see through TV iconoscope cameras and do work with robot arms. Trolley under plane contains shielded coffin to receive spent but still radioactive slugs of plutonium which will be replaced with fresh fuel





Gray shadow above is present-day B-36. Lines around it show possible evolution of shape into atom-powered plane. Longer fuselage would increase distance between atomic reactor, crew and passengers



Above, plan views of planes using the delta-wing configuration or variations of it. Left, this month's cover with artist's conception of B-58 accompanied by an F-102A, to which it bears a resemblance in all but size



that are intended to fly at 1500 miles per hour or more.

It's believed that the nuclear-powered aircraft of the not-distant future will have a delta wing. The delta seems to have special advantages where atomic power plants are used.

It's a good guess, too, that the world's first supersonic bomber, the B-58 Hustler that Convair is building at Fort Worth, Tex., has the delta configuration. Our cover painting is an artist's conception of the B-58.

B-58 Will Be Big

The plane likely will be similar to the F-102A interceptor which also appears on the cover. The B-58 will be big and heavy in spite of the fact that it's designed to travel faster than a revolver bullet. Its bomb bay is said to be large enough to pack an H-bomb.

The four jet pods that the artists placed below the wing may carry one or two engines each, depending on the size of the power plants. The pods are placed outboard instead of being buried in the wing because American designers consistently favor this safer location.

Honeycombed Hustler

Among other innovations in the Hustler is the considerable use of aluminum or stainless-steel honeycomb in the basic structure. Honeycomb has a desirable strength-to-weight ratio and also retains

Air turbine on F-102A is an emergency device that pressurizes hydraulic system and other controls in event of engine failure. It is extended when needed





Convair Sea Dart, billed as world's fastest seaplane, uses a delta wing. An early model is pictured. Later ones have a single hydro-ski instead of two

much of its strength at relatively high temperatures. Presumably the B-58 will operate at speeds at which aerodynamic heating will be a problem.

Special radar equipment has been perfected to allow the B-58 bombardier to release his armament with acceptable accuracy even while traveling at possibly 1000 miles per hour some 10 miles above the earth. It has been said, too, that some of the first production B-58s will carry electronic countermeasure devices. These might be improvements in the foil strips that bombers discharged during the last war to create a poor picture on enemy radarscopes, or they could be some entirely new system that would prevent enemy fighters or guided missiles from homing on the bomber.

Wing Is Thick at Fuselage

One virtue of the delta wing is that it can be fairly thick where it joins the fuselage and still have the low thickness ratio that is favored for high speed. This is possible because the wing itself is so deep, from leading edge to trailing edge. This thickness gives enough room for designing a very stiff wing, preferred for high load factors. It also provides room for considerable fuel storage.

Any delta wing has a large area, so wing loading is low. This provides the stability at high altitudes for which the design is noted. It also provides very desirable gliding characteristics. The F-102A, for instance, can deadstick to a landing strip more than 50 miles away from an altitude of 40,000 feet.

One of the reasons why the F-102A goes

through the speed of sound so easily is that it doesn't have a conventional tail group that tends to upset stability. The rudder makes up part of its large fin. Elevators and ailerons are combined in the long "elevons" on the wing's trailing edge. When the control stick is moved forward or aft the elevons operate as elevators; when the control stick is moved to one side the elevons move differentially and serve as ailerons.

Delta Is Logical Shape

The delta configuration seems to be the logical shape for the large atomic-powered aircraft that may be flying soon. Already, Convair is testing an atomic reactor in a big straight-wing B-36, though not for propulsion purposes. The preliminary research is being confined to studies of the radiation and shielding problems. Boeing and Lockheed among others also have study contracts on atomic aircraft.

At Northrop, Lee A. Ohlinger thinks that large military aircraft and possibly commercial airliners using atomic power are only 10 years away.

"From what we know today," he says, "we can expect an atomic airliner to be some 200 feet long, with a delta wing and a long fuselage. It will weigh 150 to 250 tons and will cruise at 60,000 feet at a speed of 1500 miles per hour or more."

The size and shape of an atomic aircraft is dictated by the fact that the power reactor requires some 35 to 50 tons of shielding, he explains. The aircraft has to be large to be able to lift such a dead weight.

To avoid destructive neutrons the crew and passengers must be placed as far as



An F-102A shown in an approach to a landing, with its various parts and outstanding features identified

practical from the reactor itself, hence the pressure cabin would be located in the nose of a long fuselage. For the same reason the reactor should be as far aft as possible. The center of lift of a delta wing is farther aft than in a straight or swept-wing, so the delta is the logical choice aside from its other advantages. The first few nuclear aircraft may not use the delta, but Ohlinger expects that in the long run it will be found to be the most practicable.

The weight of the shielding would be even greater except for several tricks that engineers have devised. One of these is the so-called "shadow shielding" by which the heaviest shielding is placed on the side of the reactor that faces the pressure cabin. Passengers and crew would remain in the shadow of this shielding and thus escape harm.

Atomic Power in a Plane?

How can atomic power propel an aircraft? Various ways have been suggested. The most practical solution seems to be to use ordinary jet engines in which the air normally is heated to 1600 degrees (critical temperature of the turbine blades) by the combustion of a liquid fuel. In the nuclear aircraft no liquid fuel would be used. Instead, the compressor air would be circulated through the hot reactor where it would be heated to the desired temperature. The jet thrust would be just the same as if an ordinary fuel was being burned. Actually, to avoid spewing contaminated air behind the plane, the reactor heat probably would be transferred to the engine air by a heat exchanger.

One reactor would furnish enough heat to operate as many jet engines as would be needed for propulsion. To avoid heat losses from long duct runs it is probable that the jets would be grouped closely at the center line of the plane.

From the power standpoint there's no reason why an atomic aircraft can't be designed to fly at a speed of, say Mach 5, or about 3500 miles per hour. Aerodynamic heating would be offset by refrigeration.

It's quite possible that the ultimate atomic airliners will be able to cruise around and around the earth, staying aloft for weeks or months at a time. Passengers would arrive and depart over various cities by means of shuttle planes that would nose into a retractable air lock under the fuselage. Crews would be changed and supplies brought aboard by the same means. Only when the atomic reactor itself needed servicing would the big transport need to land.

Servicing a Problem

In servicing the plane, no one without protection would dare approach the area where the reactor is located. In fact, after a number of landings the service area of the airport itself could very easily become contaminated.

To service the reactor, a vehicle something like an armored tank with the mechanics sitting inside a shielded turret probably would be needed. They would use periscopes and TV screens to watch their work, which they would perform by operating big mechanical arms.

In such a vehicle they could move up to the rear of the aircraft, unscrew the cover plates and unload the fuel elements that needed to be replaced. These fuel cans would be dropped into a portable "coffin" located on a trailer towed by the service vehicle. Using the same robot arms, the mechanics then could load new elements into the power plant. The reactor would be designed so that any kind of servicing could be performed by the remotely controlled robot arms, including replacement of the entire reactor.

★ ★ ★

Control Tower Speeds Traffic

Before traffic jams start, they are cleared from a control tower that overlooks five intersections near the Miami, Fla., International Airport. It used to take 18 minutes for a car to get through the congested area during rush hours. Now it takes 2½ minutes. Five policemen once manned the intersections. Now one Dade County police officer stands before the control board in the tower, watches the traffic, and presses buttons to regulate the traffic lights. Five series of red, amber and green lights on the control board represent the traffic lights. If the control officer wishes, he can control the lights individually or collectively. The building and control equipment cost only \$8000.



Five series of red, green and amber lights on control board represent traffic lights at intersections. Operator can switch the lights as needed

Tower overlooks five intersections near Miami airport. Building and equipment, designed by the county traffic engineer, cost only \$8000



Detroit Police Wear Armor to Fight Rioters and Gunmen

Armored equipment to protect officers when combating riot crowds and barricaded gunmen is being added to the arsenal of the Detroit, Mich., police. One unit is an armored coat weighing 65 pounds, which has a powerful spotlight mounted on top of it. Worn with this coat are armored leg-

gings. Another unit is an armored, hand-pushed version of an ancient Roman chariot. Officers can crouch behind it, shoot through gunports while advancing and be protected from return fire. As the equipment is manufactured, each precinct in Detroit will be equipped with it.





"Curtain of Air" Is Invisible Draft and Temperature Barrier

There's no door in a revolutionary doorway for stores. Instead, a curtain of downward-rushing air acts as a temperature and draft barrier to protect the interior. Rows of overhead nozzles direct filtered, warmed, (or air-conditioned) air downward to a floor grille. There the air is picked up and

recirculated. Periodic water sprays are introduced to guard against the fire danger of lighted cigarettes. The air velocity is a gentle breeze that won't disturb women's hair but is said to keep out dogs and cats. At night, a conventional door protects the opening.

Rome Parades Antiriot Cars

Rome, Italy, is prepared for trouble—lots of it. A new fleet of antiriot cars rolled through the streets during the city's annual police parade. The twin turrets on each car spray red-dyed water instead of bullets into a rioting crowd. Strong wire mesh protects the turrets and drivers' cabs.

☐ Two cups of heavily roasted coffee or 10 cups of standard coffee have one person's daily requirement of the vitamin niacin, according to Dr. L. J. Tepley of the Wisconsin Alumni Research Foundation.



IT'S TIME to look at the calendar. The new beauties for 1957 are about to debut and you'd like to know when.

First of the new cars to hit the streets will be the Continental. Still the Mark II, still outwardly the same (and for the most part inwardly) it will be announced in mid-September. Principal reason for the announcement is to give Continental a chance to mention the many running changes that have been made during production thus far this year. There is no "1957" Continental. The company continues its policy of no annual style changes.

October Busy Month

During October, Automobile Row will be ablaze with celebrations as the following cars bring out their 1957 models: Lincoln, Ford, Dodge, Plymouth, Chevrolet, Studebaker, Hudson, Nash, Rambler. Possibly Mercury, too, but more likely later.

November, too, will be busy—at least the first two weeks of it. During that time will appear the 1957 models of Chrysler, DeSoto, Imperial, Oldsmobile, Buick, Cadillac, Packard, Clipper and Mercury, if the "Big M" isn't in October.

Well before Thanksgiving Day all the new cars will be on the street except such specials as the Chrysler 300 (due to come out early next year) and the long-awaited Eldorado Brougham (now expected to arrive in February).

The birth of the Brougham keeps being delayed as Cadillac takes plenty of time to make sure its lushest car is faultless. With such innovations as fuel injection and air suspension there could be plenty of trouble if engineering of production models isn't done with great care. And there is nothing that will make enemies like a \$10,000 car with trouble-making propensities.

Chevy's Transmission

Chevrolet's new transmission continues to excite insiders. It is said to be the closest approach to the infinitely variable gear-change yet developed. Informers report it will be a "triple turbine" design and will make frequent gear changes imperceptible to the passengers. Now that Ed Cole, former chief engineer, has been made General Manager of the Chevrolet division, you can expect increased emphasis on engineering in this family car that once was as ordinary and unexciting as Monday night at the YWCA.

At least a half dozen 1957 models will have aluminum grilles, replacing the chrome and stainless steel. Some 1956 cars (Plymouth, DeSoto and Cadillac, for instance) used aluminum in their grilles.

Grilles have been (and will continue to be) the trade mark of cars since designers

Detroit Listening Post



By Leo Donovan

covered up the radiator years ago. But recently more and more identity characteristics are being incorporated in the rear end. An outstanding example, of course, is the circular Ford taillight that has been continued for several years, varying only in size (it is continued for 1957, too).

Mercury has had trouble getting something that will "hit it off" as a rear-end recognition device and for 1957 it has what may do the job: The biggest, most dramatic, boldest bumpers you ever saw. There'll be no doubt it's a Mercury when you see the rear bumpers.

Lincoln's rear fenders will serve the same purpose. They stick outward and upward giving an instantly recognizable character to the rear end of the car.

Actually, of course, Cadillac started all this with its tailfins right after the war. Almost dropped as a result of pressure from above, the tailfins became the most successful, best-recognized feature since the Pierce-Arrow headlights.

National Auto Show

Detroit informants believe that the revival of the National Auto Show in New York City in December may mark the end of the so-called dream cars. These high-styled creations have been banned from the show. Only legitimate "for sale" production cars will be shown.

But the industry is not too concerned. It has just about decided that the dream cars are making the public dissatisfied with the production cars that are on sale.

Quietly, without any great fanfare, the Volkswagen continues to sell more and more cars over here. Now the Renault seems to be catching fire, especially the new Dauphine model.

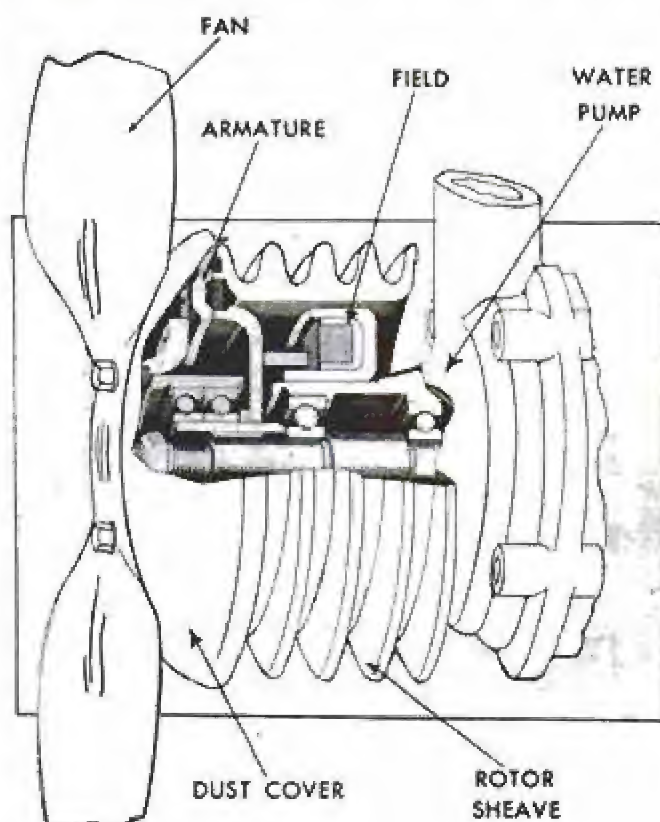
By the way, the VW will bring out a "new" model for 1957. Only the expert will recognize the difference. It will have a heavier crankshaft, larger valves and more horsepower. The heavier crank will appeal to those VW owners who insist on supercharging the little horizontal four.



B-52 Becomes Flying Convertible

Long-range B-52 bombers convert into photo-reconnaissance planes with the addition of a manned capsule that is hoisted and clamped into the bomb bay. The pressurized, air-conditioned capsule can also be used on electronic missions. Equipped with stations for a two-man crew, it has provisions for four aerial cameras, interchangeable electronics equipment and an-

tennas. Two production models of the eight-jet, 200-ton Stratofortress, the B-52B and the B-52C, are being equipped with fittings to hold the two-purpose capsule. Heretofore, a different specialized plane was needed to handle each task. The 650-mile-per-hour B-52B and B-52C operate at altitudes over 50,000 feet and have longer ranges than other American jets.



Fan Clutch Increases Mileage

By disconnecting the engine fan when it is not needed and engaging it again when cooling is required, a new fan clutch for trucks and automobiles saves horsepower and increases gas mileage. Tests made with a light truck showed a seven-percent saving of gasoline at an average speed of 50 miles per hour. The fan clutch consists of three principal parts: Stationary magnetic field, rotor and an armature. When water temperature in the cooling system rises to 180 degrees, a thermostatic-type switch sends electric power to the clutch field. Magnetic flux (lines of force) passes through the rotor (driven by the crankshaft) and attracts the armature-fan assembly to the rotor. This locks the fan to the drive pulley and drives it until water temperature is cooled below the control point, at which time a switch turns off the clutch.

☛ There are 138 species of mosquitoes in North America, and one of them does not bite people. It prefers frogs.



Tractor Fitted With Crawler Treads Takes Skiers up Mountain

Crawler tracks mounted on the wheels of a converted Ferguson tractor enable it to pull skiers up a mountain slope in Norway. An extra pair of wheels mounted between front and rear wheels keeps all

wheels turning together. The trailer holds up to 12 people, while three seated on the front of the tractor provide additional weight to improve traction. Detachable skids uphold the trailer wheels in soft snow.

"Speed Tripod" Tilts Camera 180 Degrees

Fast mounting is a feature of a "speed tripod" for cameras. A metal shoe on the camera base slips into a slot on the tripod head, and a screw is turned to lock the camera in place. The tripod, which fits almost any camera, allows normal panning and tilting operations, plus a 180-degree side tilt to facilitate the sighting of reflex cameras. The positive-locking pan head holds the camera rigidly at any angle. A quick twist of a lock screw frees the legs for rapid adjustment, and a double-extension center post gives the 4½-pound tripod a maximum height of 67 inches.



Portable Shell Reloader

In one quick, simple operation, an ammunition reloader removes the old primer cap from a spent shell, resizes the expanded casing neck and seats the new primer. Standing 14 inches high and weighing less than 20 pounds, the reloader is portable. Standard reloading dies are used.





Tent Without Ropes Resists High Winds

Sixty-mile-per-hour winds are resisted by a canvas tent that has no ropes, only nine pegs, and can be set up in five minutes. The tent weighs only $10\frac{3}{8}$ pounds while its poles weigh $4\frac{3}{16}$ pounds. It covers a square area $8\frac{1}{2}$ feet on a side and sleeps four people on the ground or two on cots. Its height is $6\frac{1}{4}$ feet. An overlapping door snaps shut, eliminating tying and untying when entering or leaving.

Boy Builds His Own Tractor From Automobile Parts



Ronald L. Swartzendruber, 14, of New Carlisle, Ohio, wanted a tractor, but instead of buying one, he built his own. The tractor's parts include the differential from one auto, the transmission of a second and the motor of a third. Ronald says the tractor really works, and he's proved it by towing a wagon loaded with 27 bales of hay—in high gear at a speed of $6\frac{1}{2}$ miles per hour.

Washington Glaciers Grow

Glaciers in the Cascade and Olympic Mountains are growing, according to Dr. Richard C. Hubley of the University of Washington. Of 73 glaciers measured, 50 have been advancing during the last 12 years and the remaining 23 have been increasing in thickness. This marks a sharp reversal of the previous 20 years' shrinkage. During the last 10 years, Hubley says, the mean annual temperature in western Washington has decreased $1\frac{1}{2}$ degrees and mean annual precipitation has increased 15 inches.



Antique Wall Phone Is Rebuilt Into Doorbell and Radio

O. O. Oxford of Dallas, Tex., has remodeled an old crank-type wall telephone into a combination doorbell and radio. After removing the original insides of the telephone, Oxford put an old sewing-machine motor in the top to drive the bell clapper when someone pushes the doorbell. The radio, an entirely separate unit, is housed in the bottom of the telephone case and is regulated with a knob on the side.



Lunch-Vending Machine Serves Hot Food and Soups

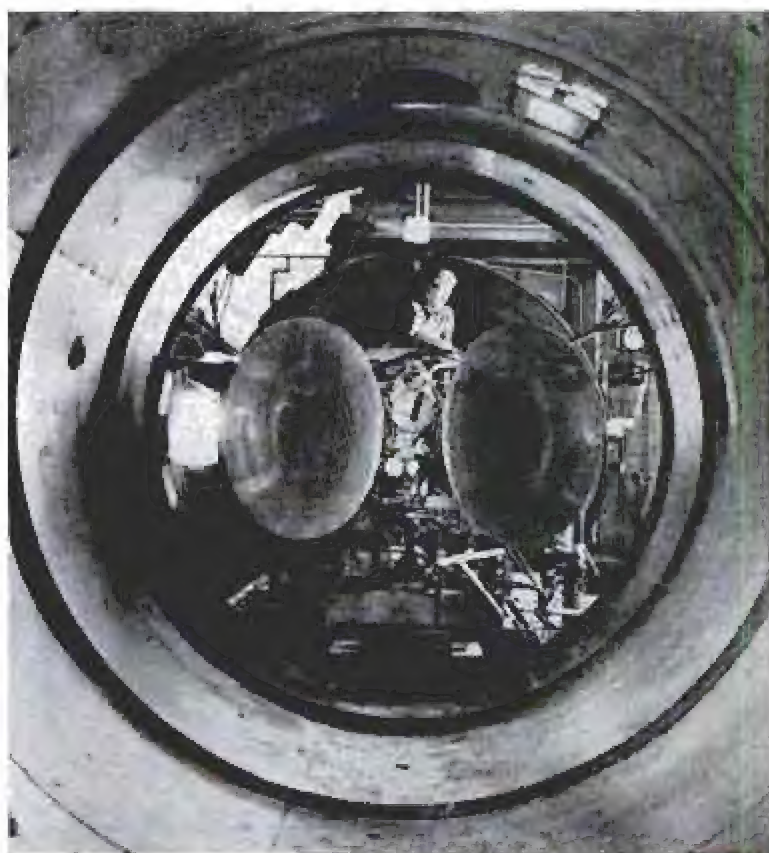
You can get hot food at the drop of a coin from a new vending machine. The food is packed in 8½-ounce (portion-size) tin cans heated to 150 degrees by the machine. Each vendor carries six varieties of hot foods selected from the total of 14 solid foods and 13 heavy soups available. A plastic spoon is supplied with each can, which is wrapped in paper so that it can be grasped safely and opened.

High-Altitude Laboratory For Aircraft Engines

Two giant stainless-steel chambers have been built as a part of the Navy's new aviation test laboratory at West Trenton, N. J. The lab was designed to put Navy aircraft engines through performance tests duplicating actual flight conditions from sea level to 65,000 feet at both subsonic and supersonic speeds. An intricate control system logs the hundreds of measurements taken by instruments during the tests.

Propose Swedish TV

Semicommercial television is being proposed for Sweden, which has no regular TV broadcasts. Part of the cost would be borne by annual fees paid by set owners. The rest would come from the sale of short commercials at the beginning and end of programs.





Long shot of battle scene being sighted, as part of animation test with 16-millimeter camera, before final shooting. Reg Massie supervises



By John Franchey



IT IS THE early morning of July 1, 1863. The small town of Gettysburg, Pa., lies sleeping as the rising sun burns off the night mists. And while the vapors rise, delivery boys for baker and dairy pause in their busy rounds to watch Buford's troops move out along the pike and head north, a trim blue line.

Buford's men are exactly two inches in height, and built to scale, as are the plywood-and-matchbox homes which they will pass. The roads they march are paved with corn meal and glue topped with granulated sugar rolled out to a fine level by large rollers made of empty typewriter-ribbon cans. For the road surface must catch the highlights which will be cast

upon it by the photographers' lamps when the shooting starts.

The shooting will be done with a 35-millimeter camera by Reg Massie, art director for a New York publication and an alumnus of Hollywood's famous Disney Studios. The miniature soldiers and other figures numbering in the thousands have been created by his wife, Nancy, and several other artists—all Disney grads and all residents of talent-rich Westport, Conn.

For this is a miniature setting for the three-day Battle of Gettysburg—the bloody Civil War conflict from which the South never recovered. It will be shot in full color and completely animated. Red cannon fire and yellow rifle flashes will send

up clouds of dark smoke. There will be attacks, counterattacks and probing actions—and all the rest of the standard movements of war.

Massie and his wife got the idea for the present production while both were attached to the Signal Corps during World War II. Their job was to re-create the battles of the Pacific with animated maps and figures so that the War College

Artists Don Noonan and Tom Armstrong, right, check town of Gettysburg before ordering Buford's column to march through it. Below, union artillery lumbers into position



could study them. From this came the original inspiration that led to the Gettysburg production.

"As soon as we got back to Westport," said Mr. Massie, "we began rounding up materials. To make sure every item would be authentic we ransacked old map shops and book stores down on Fourth Avenue in Manhattan. Today we've got a superb collection of Gettysburg material which even includes some of the famous Warren maps of the campaign, as well as Brady photographs and issues of *Harper's Weekly* covering the period."

Although the three days at Gettysburg were among the most terrible in the history of organized warfare, Massie and his associates aren't concentrating on this aspect of the struggle.

"What we're after," he said, "is a kind of stylized effect—something like you get in the Currier & Ives prints. After all, even the bloodiest war can be viewed with a little nostalgia almost 100 years later."

Complete accuracy of detail is the keynote of the Gettysburg scene, painstakingly re-created on a plywood platform in Mr. Massie's studio. Realistic railroad tracks wind through fields where the ripening corn stands higher than a man's head (speaking in scale, of course). This is the backdrop for



Above is the view the camera shown in the first picture has of the battle. Below, Nancy Massie examines shelves of figures





Above, action scene at the field hospital on the third and final day of action. Left, a close-up of one of the "actors," showing the careful attention to detail

Below, top Union brass pose for photographer Matthew Brady before breaking camp at Aquia Creek to depart for Gettysburg. General Hooker, seated, was replaced by General Meade before battle fought three days later



the morning of the first day of the battle.

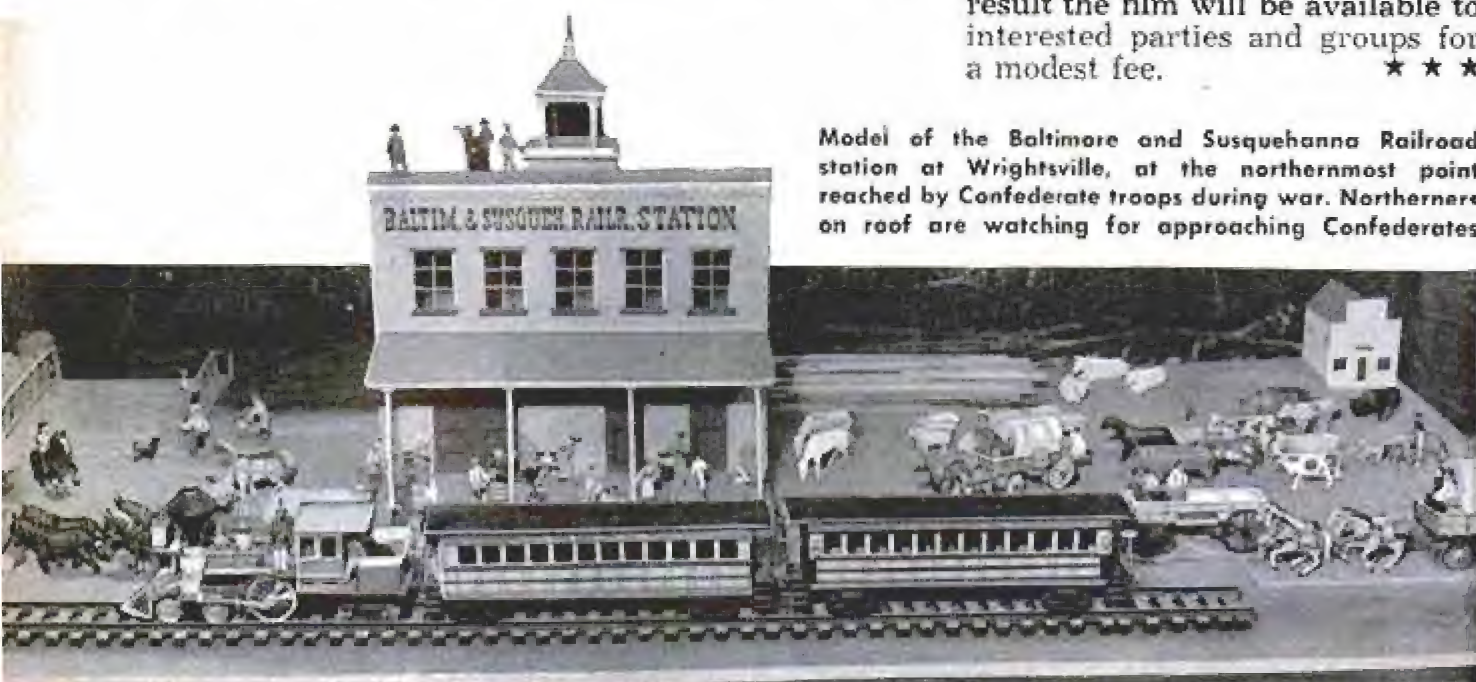
Mr. Massie says: "This would never hold up as a diorama since it was made to be photographed. The important thing is that things look right to the camera.

"Take that railroad station at Wrightsville — the farthest north the Confederate troops ever penetrated. It shows a train of the Baltimore and Susquehanna Railroad pulled up at the depot with a scattering of civilians, a few military personnel and a number of animals milling about. They are all Northerners. Looks pretty genuine, doesn't it?

"See those stone walls bisecting that field?" he went on. "They play a big role in the battle of the first day. They're on Cemetery Ridge where Howard's 11th Corps made good defensive use of them for the Union. We created those walls of rice and Puffed Wheat.

"We all learned to be pretty ingenious out in Hollywood with Disney. The wheat fields, for instance, came from the yellow whiskers on kids' Halloween masks. The houses, barns and other structures are largely of plywood and balsa, though some farther back are of ready-made plastic or tin from the five-and-ten; those far in the background are merely small matchboxes, properly painted or stained.

If produced commercially, the project would run to a good \$150,000 or more. However, with the participating artists pitching in on a cooperative basis the actual cost will amount to \$25,000 or so. As a result the film will be available to interested parties and groups for a modest fee. ★ ★ ★



Model of the Baltimore and Susquehanna Railroad station at Wrightsville, at the northernmost point reached by Confederate troops during war. Northerners on roof are watching for approaching Confederates



Voice of America System Handles Programs in 39 Languages

In Washington, D. C., the Voice of America has put into operation its master control equipment, believed to be the largest and most flexible in the world. Work on

the new radio facilities in Washington is now completed. The equipment was specially designed and constructed to handle the agency's 39-language programs daily.

Truck-Tire Remover Uses Hydraulic Jack to Spring Bead From Rim

Truck tires are removed in a hurry with a portable, heavy-duty unit that employs a hydraulic jack. The truck wheel is placed on a base and a circular press goes on top of the tire. Extending inward around the circle of the press are metal fingers with built-in rollers that prevent jamming and

damage to the bead. On the press is placed a V-frame with a pull rod that is fastened on the bottom to the base and on the top to a hydraulic jack. Turning a crank on top of the jack takes up the slack before a lever is pushed to activate the jack and spring the tire free of the rim.





Pumping stations lift water from three rivers into Billings Reservoir, named for an American engineer

BRAZILIAN POWER GOES

By Newton Brown

THE CITY OF SAO PAULO, say many Americans who come to Brazil, is the "Chicago of South America"; a city of modern skyscrapers and humming factories that is as fast-moving and as hard-working as its North American counterpart. But few people who compare these two cities realize that the power that made this industry possible comes from one of the world's most unusual hydroelectric plants.

Sao Paulo, a city of 2,500,000 people, is only 33 miles from the Atlantic, but it is 2300 feet above sea level, more than twice as high as the Empire State Building. It lies on the Brazilian highland plateau that slopes gently away from the sea toward the interior. Thirty years ago, rain falling only 10 miles from the Atlantic flowed 2000 miles inland before returning to the ocean near Buenos Aires.

Back in the 1920s Sao Paulo was in search of a hydroelectric site. And it was A. W. Billings, an American engineer, who conceived the idea of using an "electric syphon" to make the rivers near Sao Paulo flow backward in order to take advantage of the 2350-foot drop from the edge of the plateau down to Cubatao, which is almost at sea level.

By constructing the Pedreira Dam just

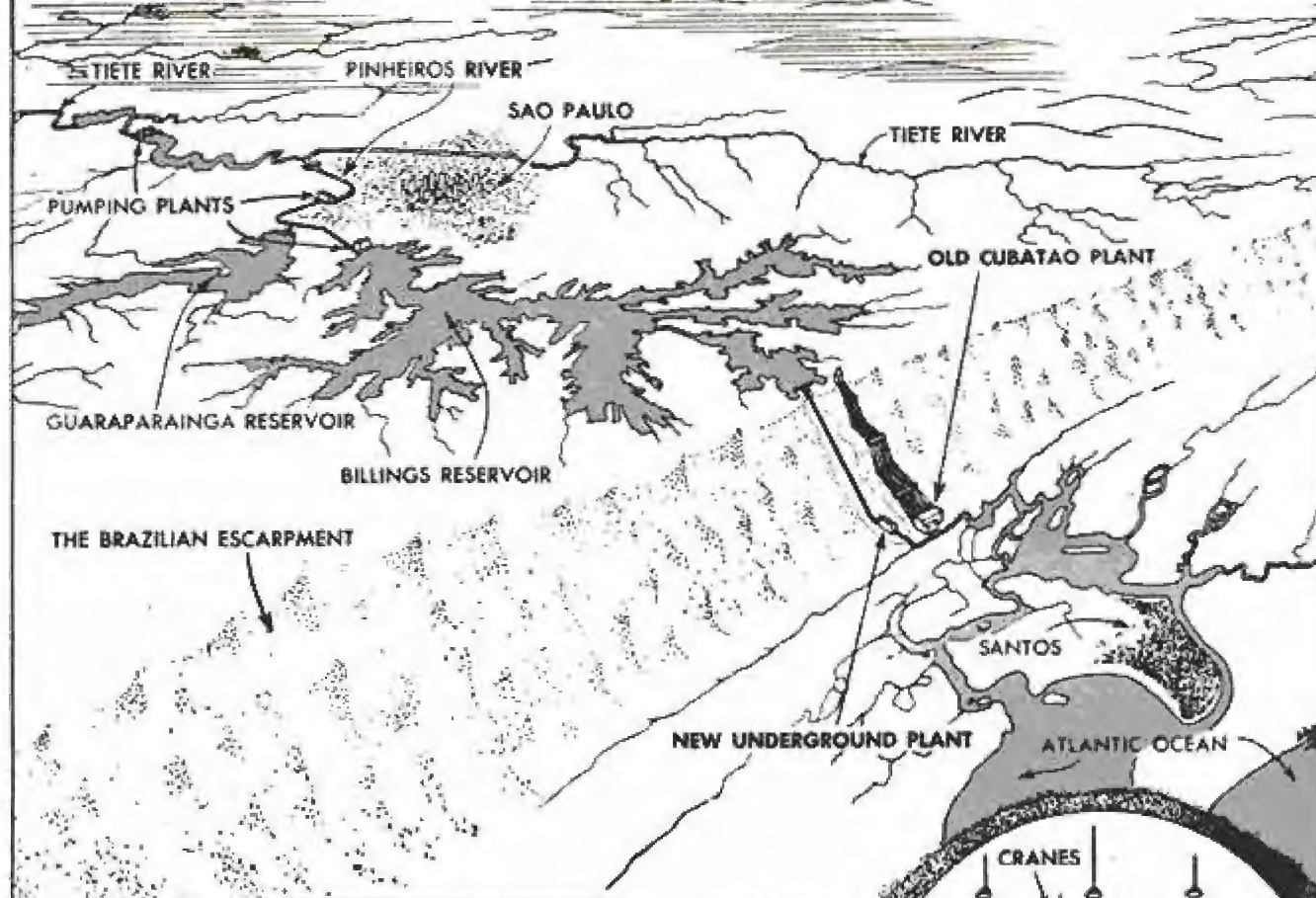
south of Sao Paulo, the Billings Reservoir was created which backed water up to the edge of the plateau. A series of pumping plants then lifted water from three rivers—the Tiete, the Guaraparainga and the Pinheiros—into this reservoir. The electric power required to lift this water was multiplied 42 times by the generators in the hydroelectric plant constructed at Cubatao.

This plant was built entirely above ground. Water from the reservoir entered a valve house and from there dropped in a manmade waterfall through steel penstocks to eight generators capable of turning out a total of 484,000 kilowatts.

Just completed is a new underground plant that has almost doubled the electric-generating capacity. This new plant has four 65,000-kilowatt generators and provision for two more, making a total capacity of new and old plants of 874,000 kilowatts, nearly that of Boulder Dam.

More than 1000 Brazilians working under the supervision of 14 American tunnel veterans excavated 460,000 cubic yards of rock and earth, blasting out 8582 feet of tunnels and shafts, traveling sometimes only 14 feet a day.

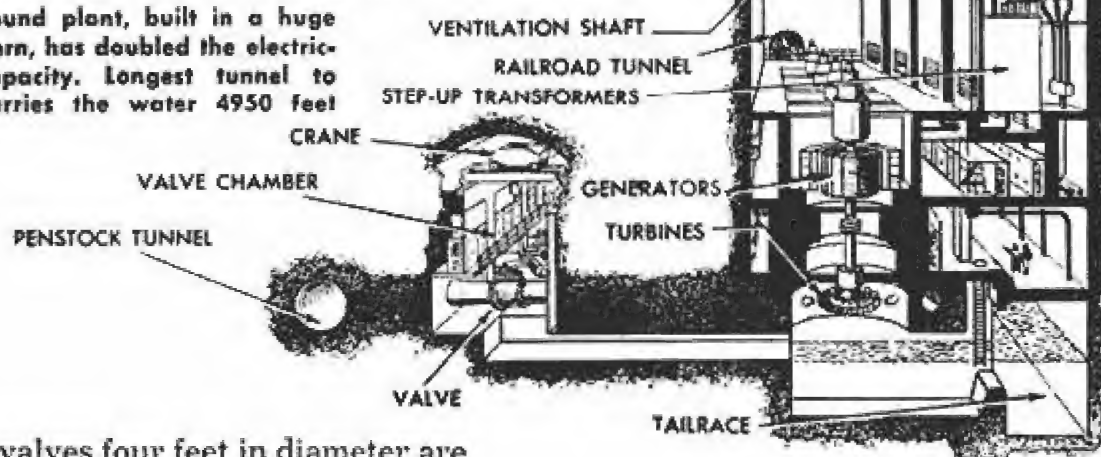
The longest of these tunnels, a penstock 11 feet in diameter, carries water 4950 feet from the reservoir down to a valve cham-



Water falls from reservoir on the high plateau almost to sea level

UNDERGROUND

New underground plant, built in a huge manmade cavern, has doubled the electric-generating capacity. Longest tunnel to the cavern carries the water 4950 feet



ber. There, valves four feet in diameter are hydraulically operated by water from the penstock.

From the valves water flows to the 88,000-horsepower, vertical shaft, four-jet turbines. And the flow in the jets is automatically balanced by a "nervous system" in which one jet acts as a "master" and the other three follow as "slaves." Turbines operate at 450 revolutions per minute under a pressure of 970 pounds per square inch.

Above the turbines are mounted generators whose rotors hang from combination guide-and-thrust bearings, each taking a total thrust of 337,000 pounds. For each generator there is a transformer which steps up the voltage from 13,800 to 230,000 volts.

Generators, turbines and step-up trans-

formers are all housed in a subterranean cavern which is big enough to hold a 13-story 400-family apartment building. There are four tunnels serving the power cavern: One is the tailrace from which water leaves the turbines, another is the ventilating tunnel and a third is the 1500-foot cable through which power from the transformer is conveyed to a switchyard outside. The last is the access tunnel which is 738 feet long and has a siding so that heavy equipment can be brought directly into the cavern by rail.

In May of this year all four of the new generators were on the line, boosting by a third the electric power for São Paulo's industrial boom. ★ ★ ★



In skijoring, man on skis is towed over flat course by low-flying plane

Skijoring Called Most Dangerous of Winter Sports

Present world's speed record for skijoring is 109 miles per hour for skier

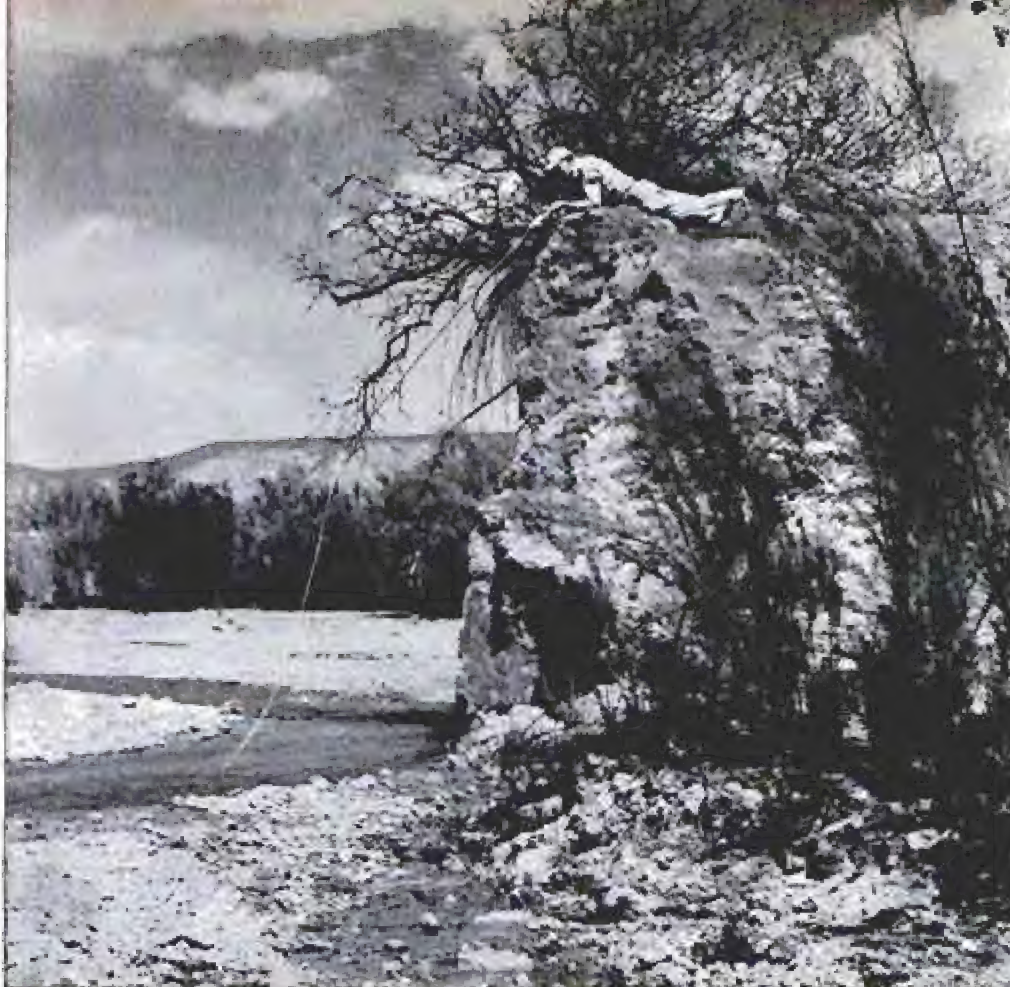


Skijoring is the latest sport to become popular at European winter resorts, in spite of the fact that it is probably the most difficult and dangerous of winter activities. In it, a man on skis is towed over a flat course by a low-flying plane. The pilot of the plane must maintain an altitude of just a few feet while he simultaneously watches his instrument panel and the skier behind him. The present world's speed record for the sport, set near St. Moritz, Switzerland, is 109 miles per hour for the skier over a five-kilometer course.

Globe Inflated Like Balloon Weighs Only Two Pounds With Frame

Lung power easily inflates a balloonlike world globe that spins on its axis in a lightweight metal frame. Frame and globe together weigh only two pounds. The 18-inch globe is printed in bright colors and sharp type and is equipped with a time dial to compare times in different parts of the world. The surface is protected by transparent plastic, so that temporary markings and routes can be drawn with a crayon.





When the water is crystal clear in the fall, it pays to go to extremes to keep hidden. You can see the trout better at this time, but he can see you, too. And the sight of a moving figure makes him wary

By
Russell Tinsley

This happy angler displays five-pound trout he has just pulled in from the waters below El Vado Lake, N. Mex.

Don't Stop Fishing at First Frost

You have to change tactics to outsmart those wary old trout in the fall

TOO MANY ANGLERS pack their fishing gear away after Labor Day and regretfully bid farewell to the trout-fishing season. In some states law compels them to do this; with others it merely is a habit. Over one third of the states have trout seasons which extend past Labor Day, this being especially true in the West.

Some mighty decent trout fishing still beckons after the first frost. When tree leaves begin to change color and the air gets nippy, I change strategy and enjoy a form of trout fishing I never could have on opening day.

It takes an entirely different form of trout savvy to succeed during the fall. On opening day the snow-fed streams are murky and straining at their banks; in late fall the water is low and clear as a pane of window glass. The trout are wary, only the hardy surviving the horde of early-season enthusiasts, and they'll be lying in spots you'd never dream of finding them in the spring.

Perhaps a stream is a mass of swirls and eddies during the spring when runoff waters are breaking around





HOT SPOTS FOR AUTUMN TROUT

Learning to "read" a stream is important to trout fishing at any time, and doubly important for autumn fishing



Above, he's got one! And judging from the bend in his rod, that trout is putting up a scrap. Below, note the big flies for autumn and the smaller spring lures

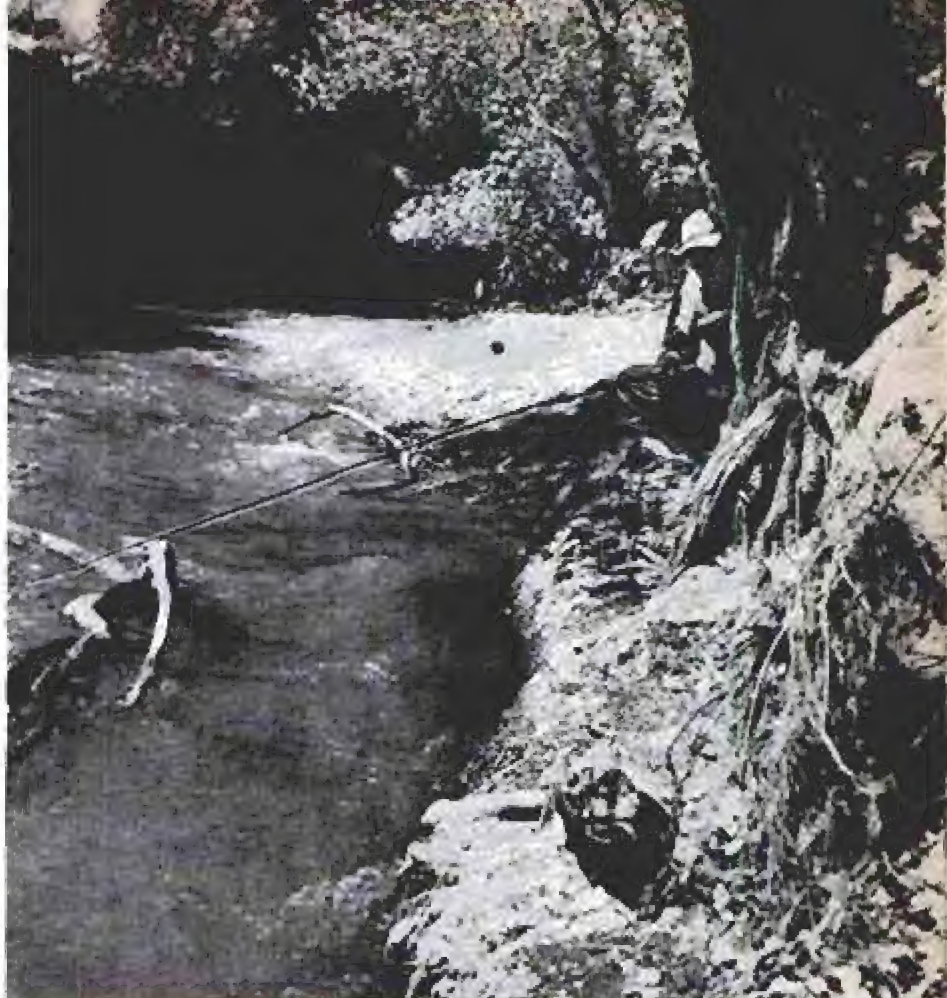


rocks and through narrow channels. During the fall this same spot may be only one main channel, void of bordering eddies and with boulders protruding in spots you had no idea existed earlier in the year. Trout may be feeding in water that is only half as deep as it was opening day, and you're going to find it necessary to alter retrieve and bait to catch fish. But you'll gain a satisfaction from catching an autumn trout that will never come from creeling one a couple of months earlier. This late-fall trout fishing requires skill, and the pay-offs can be extremely gratifying.

The closest trout fishing to my Texas bailiwick is found in New Mexico, over 600 miles away. On opening morning a few years back I was on the Rio Ruidosa, a small spring-fed stream that spills through the Sacramento Mountains in the south-central portion of the state. As I fished, I jotted down pertinent facts about certain holes so I would know the choice spots to hit whenever I returned. After those initial two days, it was late fall during the hunting season before I returned to New Mexico and could break out my tackle.

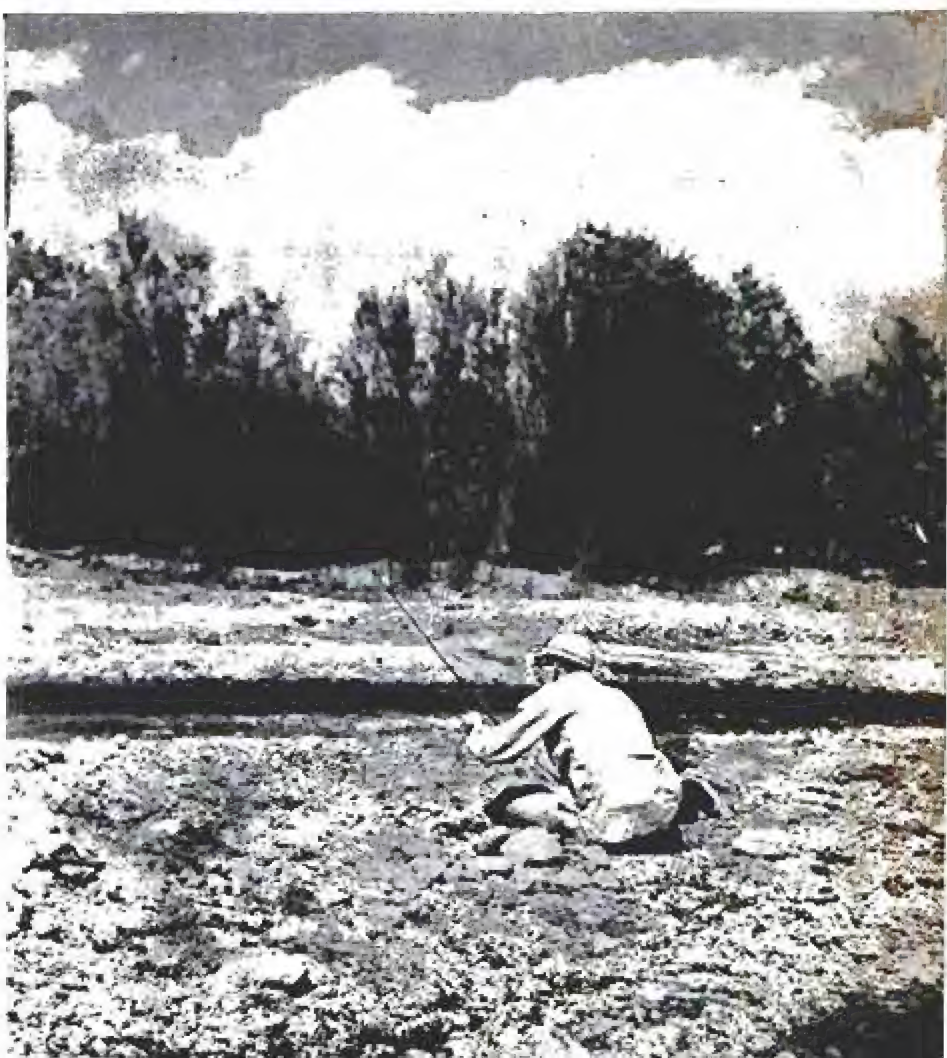
I tried that identical stretch of the Ruidosa again, expecting some superb fishing. But now the river had changed! In one particular spot, where I had a large eddy crudely drawn on my map, there was nothing but a sluggish current deep in the river bed. Another spot indicated deep, fast rapids, a place where I had taken two nice trout on opening day, but during fall the swift water was so shallow it barely covered fist-size pebbles. I had to seek entirely different spots for my autumn fishing, for the topography of the stream had altered with the water level. Yet I caught a trio of chunky rainbows.

Unless the stream is exceedingly large,



During the autumn months, when only the big, wary fellows are left in the water, stealth is as important as the right lure

Advice from the experts is: When trout fishing, stay back from the bank of a clear stream. This may mean some unusual casting



you may as well leave your waders at home during the fall. The clear water gives both parties an advantage; you can spot the trout, but also they can spy you. Wading, you are conspicuous; but by sneaking silently along the bank, you can catch many trout unaware.

Advance on a hole cautiously. Sometimes it pays to crawl, and frequently you must cast from a sitting position. Keeping out of sight and presenting the bait naturally are the prerequisites for successful autumn trout angling.

Under such conditions, I prefer a light 7½ or 8-foot fly rod. Streams in the fall are, on the whole, narrow, and you don't have to worry about distance as you did when the river was high and murky. Accuracy is much more important. And I've found you can control your fly much better if your tackle isn't bulky.

There's also another strong argument for delicate tackle. When the stream is high and currents powerful, a small trout can battle long and hard in the fast-moving water. It is only trout against tackle when water is low, so you'll find much more sport by utilizing a dainty rod.

Wet flies have paid off most consistently for me in the fall. Occasionally you can find some good dry-fly angling if conditions are right. Big gawdy flies will bring the most strikes, and there are several good reasons for this.

Thanks to an old-timer I met on a New Mexico trout stream a few years back, I learned of this

(Continued to page 274)



Underwater Sea Horse

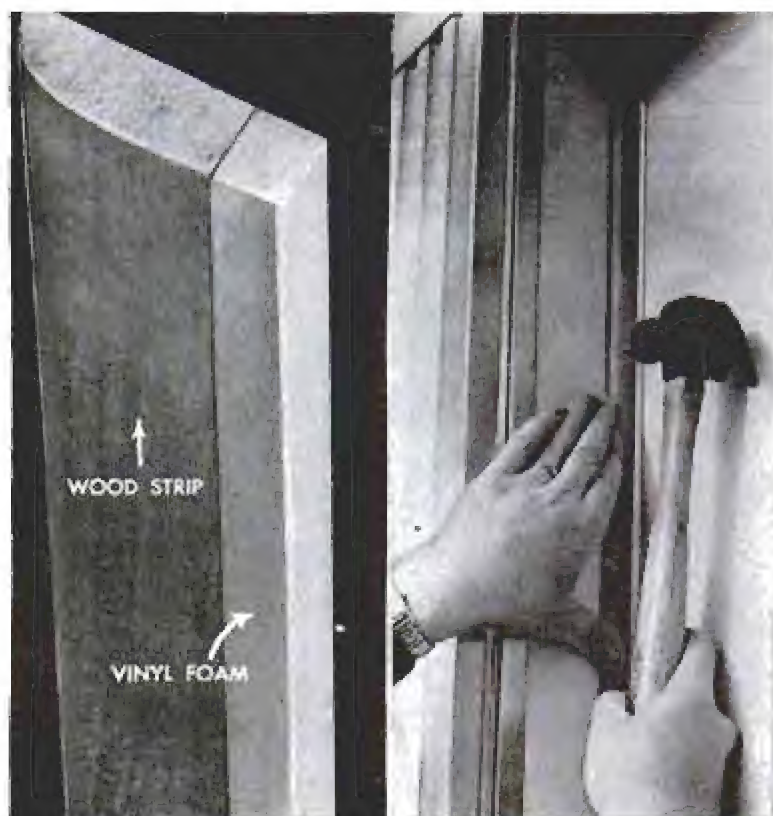
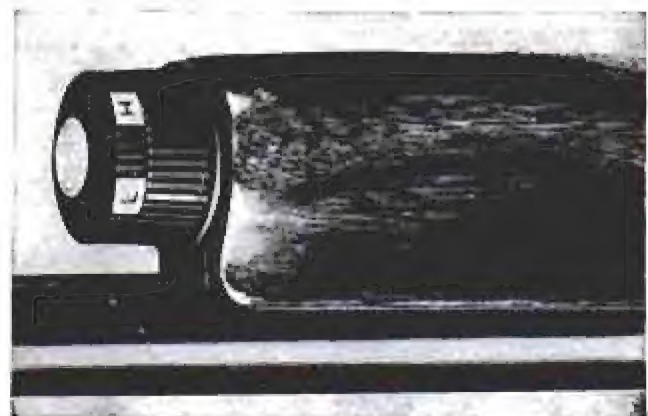
Pegasus, an underwater sea horse for skin divers invented by French engineer Dimitri Rebikoff, gives its operator mobility beneath the waves. Ridden like a bike and steered with handle bars, it is equipped



with a two-horsepower motor and a depth governor. It has two headlights and mounts an underwater camera, also an invention of Rebikoff's, for taking color pictures of marine life.

Dial Selects Light or Heavy Load in Shotgun

You can dial a light or heavy load to soften the recoil on the new Remington Sportsman-58 shotgun. A knurled knob on the fore-end is rotated to one of three positions, venting the piston mechanism according to the load selected. This assures proper operation of the gun when firing light or heavy loads up to the standard-length magnum. Models are available in 12, 16 or 20 gauge.



Vinyl-Foam Weather Strip Is Bonded to Molding

Edged with vinyl foam, a beveled molding becomes a permanent part of any doorframe and at the same time serves as a weather-tight door seal. The molding is $\frac{1}{4}$ inch by $\frac{5}{8}$ inch and is available in sets of seven and three-foot lengths. Strips can be nailed over existing doorstops or in place of the old stops. An entire door can be weather-stripped in less than 10 minutes. In addition to providing an airtight seal, the strips assure silent closing of doors.

☛ On July 10, 1955, rain fell at one point in central Iowa at a rate of .69 inch per minute, setting a new record for the United States and possibly for the world. Rain falling at this rate for one hour would total nearly four feet of water.



The Glacier carves a dock in the bay ice of McMurdo Sound. With her 21,000-horsepower engines she crushes a form-fitting berth in 12-foot ice

Reprinted "PM Highlights"

Antarctic Album

Nobody thinks of polar areas as colorful, but I found a good many vivid hues when I visited Antarctica with Operation Deepfreeze. Here are some typical color scenes from the bottom of the world

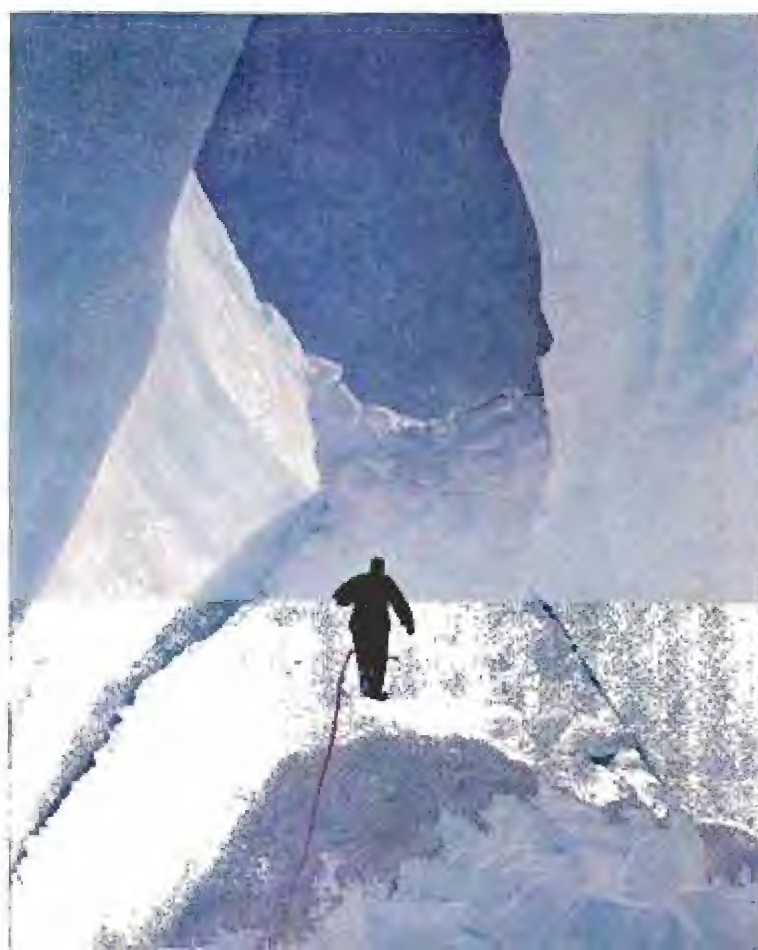
By Richard F. Dempewolff, PM Editor With Task Force 43

Blue grottoes

in crevasses of the Antarctic are beautiful, but are booby traps for vehicles. We explored this one to a depth of 100 feet

Your grizzled correspondent

wore a beard to avoid painful shaving with snow. The Thermosuit is red for easy spotting





Seventy-five-foot radio towers

still stood at Little America I, but only eight feet remained uncovered when we visited the 1928 site with Admiral Byrd this year. Wearing a reindeer-skin suit, Byrd flew to the site to pay tribute to his first camp

Antarctic sunbathing

is the popular recreation of seals that emerge from the cracks during the subfreezing summer. Some varieflies weigh 500 pounds. They ignore humans but "moo" when patted





South Pole housing - antique and modern

sit side by side at Hut Point. In the background are prefabricated homes of the air-facility camp for the expedition. In the foreground is the prefabricated house erected by Scott in 1902, now filled with snow

"I'm the mayor of this place"

Admiral Byrd told us as he stepped from the *Glacier's* helicopter at the ice-prairie site of Little America I. Cameramen recorded his visit. Last year a 220-mile chunk of his desolate domain broke off and went to sea





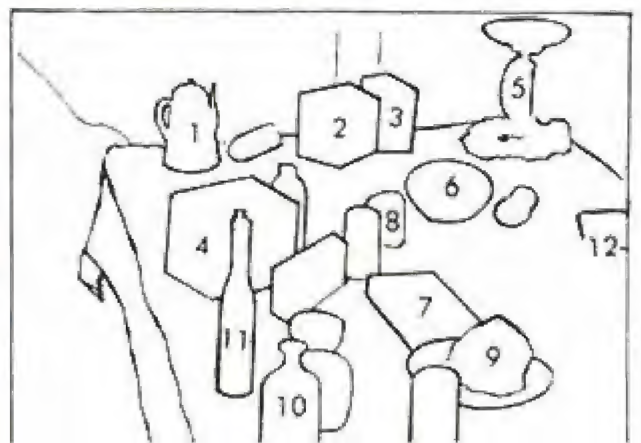
Lonely cross

erected by the British still stands on a peak at Hut Point, commemorating the heroic journey of Scott and four of his men. They died returning from the Pole in 1912. Our surveyors used the hill for a map station



Antarctica's ghost story

In a hut we found meal left by Shackleton party in 1917. Preserved by polar frost and still edible are: 1. Coffee; 2, 3, 4. Biscuits; 5. Scale and cake; 6. Potatoes; 7. Candy; 8. Bread; 9. Cheese; 10. Photo chemical; 11. Wine; 12. Camera back





Boy meets girl



Boy gets girl



Plus a dividend



And family responsibility

On a volcanic ridge in Antarctica we found 35,000 Adélie penguins busily enjoying family life. One old-timer waddled out to greet us each day. Extremely sociable, they seem to think people are just big penguins

Workhorse vehicles for snowfields

are the tracked Weasels, left, and the newer Sno-Cats, right, with four steerable tracks set on the chassis like outriggers. These two, painted orange for quick spotting from ice or air, are loaded for the trail





Swimming is fatal

in the 28-degree polar sea, though these experimental immersion suits may stretch life expectancy to 35 minutes. In normal clothing, man can live only eight minutes at the most, may succumb quicker than that



How strong is the floor?

South-polar-bay ice melts from beneath instead of above, so drill crews test it regularly. Despite such checks, one big tractor crashed through the ice

Light trail party

of Sno-Cat sled trains heads out across 600 miles of storm-swept ice to find a site for observation camp for scientists during International Geophysical Year



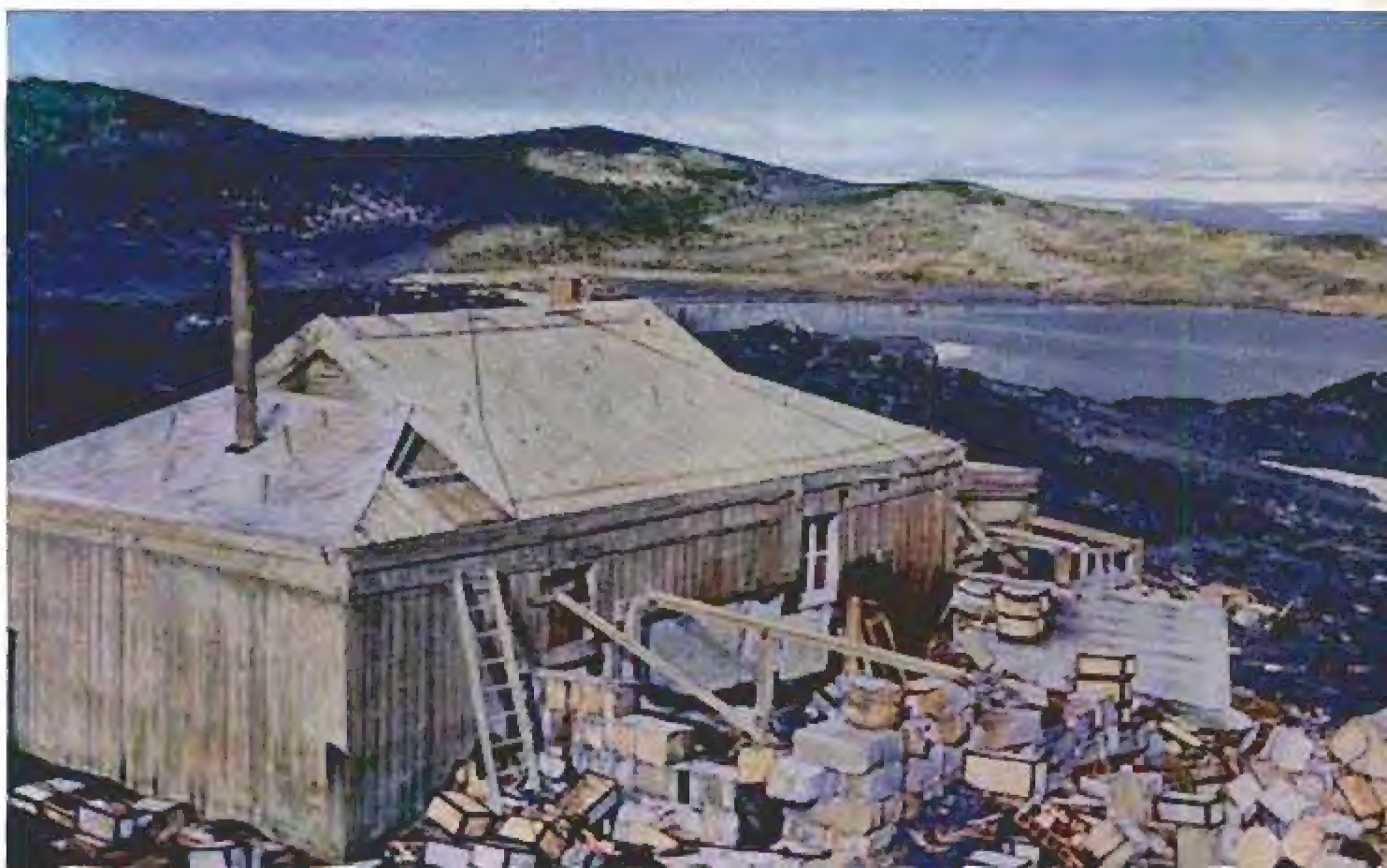


Deepfreeze paratroopers

have four legs. The expedition's dog teams, used only for rescue and survival when a plane goes down on the icecap, are flown over the crash scene and dropped by parachute, along with sleds and provisions

Relic of antarctic history

is this hut erected by Shackleton at Cape Royde in 1908. Tons of food cached around the building are well preserved. We drank cocoa and ate jam and cheese that had lain in this open freezer for nearly 50 years





Probing electronic hand

on the front of this Weasel is a crevasse detector under test. It is used over unexplored ice. When it passes over a snow-bridged chasm, the detector starts flashing a warning light inside the vehicle's cab



Home sweet home

to these dog drivers was a bleak tent. The temperature stayed below freezing from the knees down, but sometimes was a cozy 40 degrees at head height

Farewell to Antarctica

was marked by an emergency visit to Little America V to unload a search plane to find survivors of a crash. The ice had broken out of Kainan Bay and ship moored at barrier cliffs, only 25 feet high here





An average of 187 ships of the Reserve Fleet is usually parked in the Hudson, 30 miles above New York City

Keeping 2000 Ghost Ships Alive

By Creighton Peet

THE SIGN by the side of the road reads "Hudson River Reserve Fleet," and you walk up a gangplank into a nightmare world. As far as the eye can see is a forest

Diesel for ship's electric generator is sprayed with machine oil. Engines are periodically turned over

of masts, funnels, derrick booms and deck-houses. But there are no signs of life anywhere among these ships without lights, heat or throbbing engines.

By means of wooden gangways you pass quickly from one ship to another, walking

Walkways connect all ships in a row, but rows can only be reached by small boat and shipside ladder



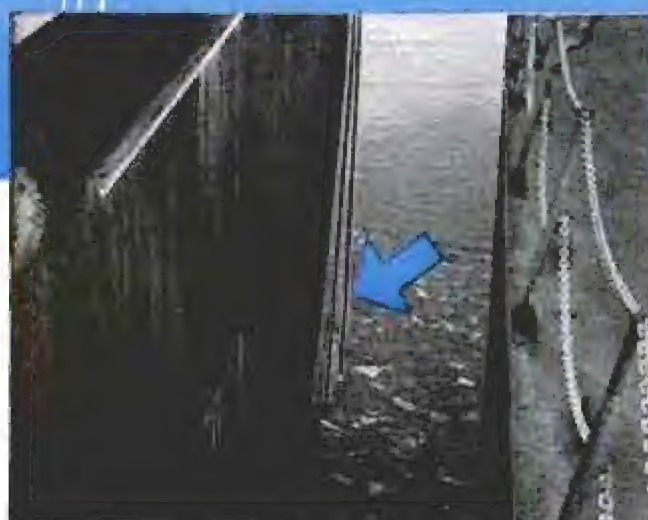
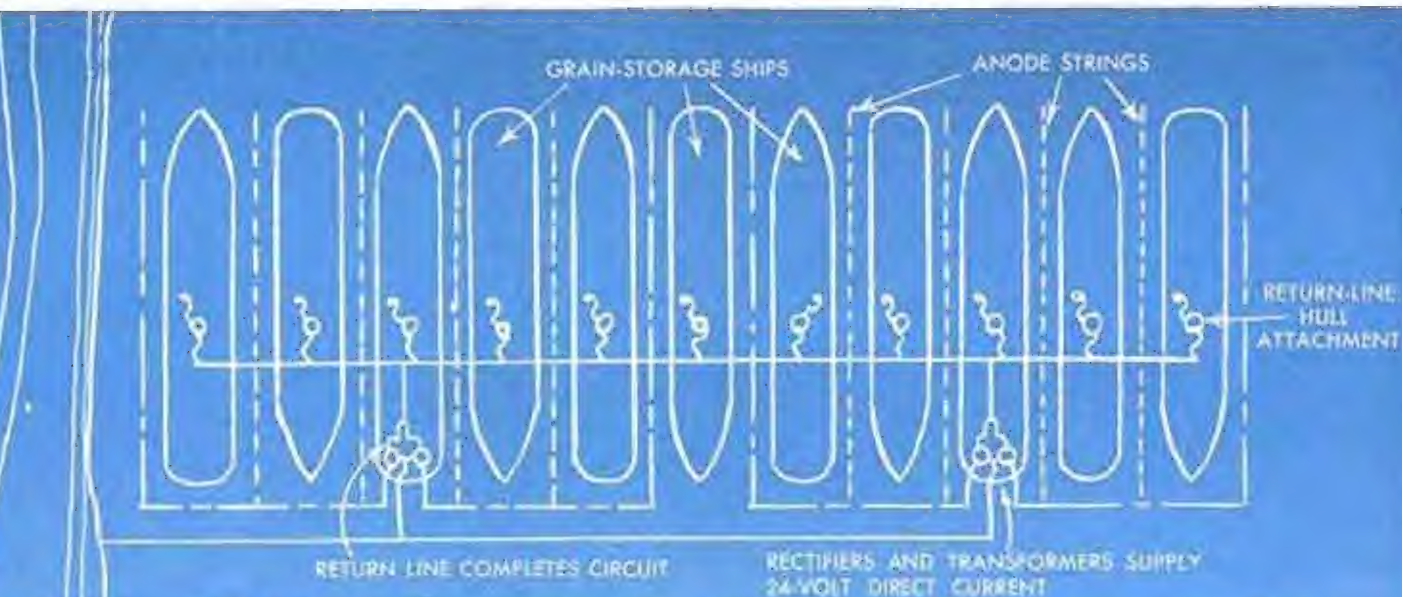
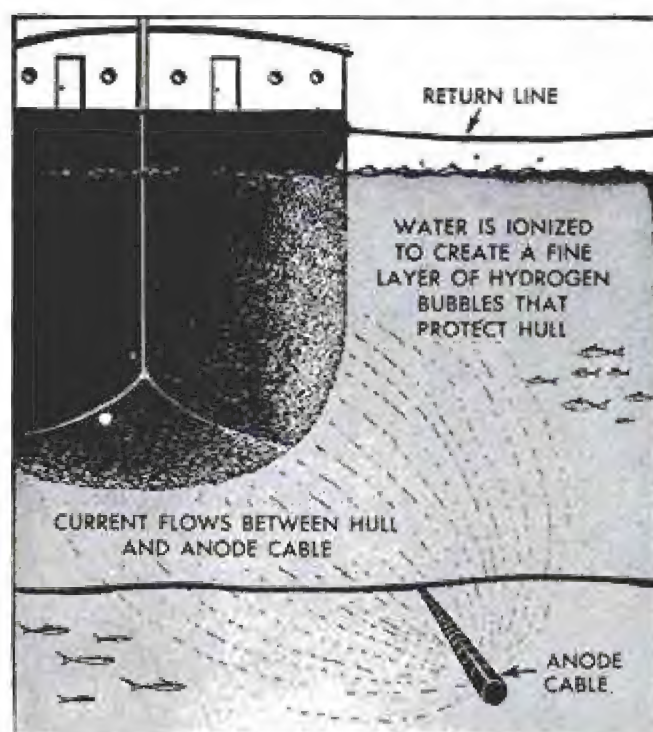


Diagram shows line of ships hooked up for cathodic protection. Power line from mainland supplies rectifiers and transformers with 440-volt alternating current. Arrow points to test rods beside ship. One is hooked up to cathodic protection system, the other is not. Close-up view shows difference in corrosion between rods

Diagram shows principle of cathodic protection system. Hydrogen bubbles on hull guard it from corrosion



right through the crew's quarters at mid-ships. All doors and some ports are wide open. In the bobbing light from the miner's lamp on the hard hat they have given you, you see bunks, galleys, coils of three-inch hawser, piles of furniture and glass-covered bulletin boards that sometimes bear notices from World War II or Korea fighting days. All these ships—Liberties and Victories, mostly—saw service carrying food and arms in the Atlantic or Pacific. On the bottom panels of the doors are notices in big block letters, "Kick Panel Out" recalling the Nazi submarine war. When a torpedo hit, a jammed latch or lock could be fatal.

This Hudson River Reserve Fleet is one of eight such groups of war-built freighters, of which the government still has some 2110. Here in the Hudson there are, on an average, 187 vessels, lashed together with anchor chain, in rows of 15 to 30 each, with square timber fenders hung between them to keep the ships from damaging each other.

You keep passing from one ship to another until the subdued whoosh of a

dozen big electric blowers catches your ear, and through a hatch you see a hold filled with government-owned wheat. Stored in these ships is grain worth some \$45,000,000. For 16 hours a day during cold weather, fans connected to big pipes sunk deep in the grain keep cold air circulating through it until its temperature is lowered to around 35 degrees. With hatches closed in summer, this natural air conditioning lasts through most of the hot weather. Even when it is 95 outside, the wheat seldom is above 60 degrees. Low temperatures discourage insect infestation.

These Reserve Fleets are far from being rusty junk yards, and the Maritime Administration has recently changed the color of the preservative paint on the above-water structures to convince the public of this. Impressions of rust came from a reddish paint and oil covering, which is now being changed to gray.

The most important new development in caring for these billions of dollars worth of ships has to do with the cathodic protection of the underwater portion of their hulls.



Ships are lashed together with anchor chain in rows, 15 to 30 vessels in a row. Square timbers between ships act as fenders

If ships see action again, they may need to be reconstructed for faster speeds. Here, new prow is fitted

Bethlehem Steel photo





Probe contains pockets along its entire length that catch wheat samples at different levels. Pockets close when knob at top is twisted. Below, 15-foot probe is sunk into grain in ship's hold



This calls for strings of graphite anodes in the river mud between the pairs of ships, and establishing a difference in potential between these anodes and the ships' hulls. Current flows between hulls and anodes.

Electric current is brought in from a nearby utility line at 440 volts alternating current. Through transformers and rectifiers, this is changed to 24 volts, 140 amperes direct current. The positive side of the line goes to anodes through waterproof cables, while the return line is welded to deck plates of each ship. The difference in potential produces a covering of fine hydrogen bubbles on the hulls, preventing any pitting or rusting.

Taxpayers' Delight

The saving to taxpayers from this cathodic protection is spectacular. Not only are the hulls kept free from corrosion, but the trips to dry dock for scraping and painting have been eliminated.

Electricity for this protection costs around \$22,000 a month for the 187 ships in the Hudson, or about \$264,000 per year, plus the cost of replacing the anodes about every seven years. On the other hand, dry-docking all of these ships at proper intervals would cost well over \$1,000,000 a year. Above the water line, hulls are covered with rust-resistant paint.

Only the Ships Are Idle

About 160 men work all year 'round keeping this Hudson River Fleet in shape. Engine, deck and electrical-maintenance departments have regular schedules.

Once a year, all the machinery on each ship gets a thorough going-over. A barge carrying a diesel engine which operates an electric generator and a compressed-air pump is floated alongside a row of ships. Lines and hose are hauled up over the side and the engine-room crew gets to work. The electric power line is hooked into the ship's electric system to provide illumination and operate pumps, compressors and the like. If the main engines are diesel, they are turned over a few times by electric motors. If they are steam reciprocating units, they are operated by compressed air. In most cases all moving parts are sprayed with oil.

Electrical crews check wiring and tag defective lines.

The actual work of making a ship ready to go to sea again is done in shipyards. The record for this renovation is seven days, but the usual time is three weeks. Over 200 Reserve Fleet ships were withdrawn to carry supplies to Korea, and another 500 were used to carry food, coal and other materials for foreign-aid programs.

The grain stored in these ships is under the supervision of Department of Agriculture technicians, who watch its temperature carefully with thermometers on long probes thrust deep into the grain. Other probes bring up samples of wheat, from varying levels, which are inspected for signs of insect infestation.

No "Mothball" Fleet

Reserve Fleet officials in the Maritime Administration of the Department of Commerce have a very different concept of ship preservation from that of the Navy. Whereas the Navy seals up much of its equipment and vital areas with airtight coverings, Reserve Fleet merchant ships are ventilated as much as possible.

But it is now realized that merely preserving the ships is not sufficient. If they should be called back into wartime emergency service, their present top speed of 10 knots would have to be boosted to 15 or 16 knots for convoy duty in waters that may be infested with fast enemy submarines.

Accordingly, the Liberty Ship and Engine Conversion Program is testing four of these ships that have been converted for faster speeds. New and longer prows were installed. Two of the Liberties are powered by improved diesels, one by a steam turbine and one by a gas turbine.

Meanwhile, in the eight Reserve Fleets located in the Hudson River above New York; the James River, Wilmington, N. C.; Beaumont, Tex.; Mobile, Ala.; Suisun Bay, Calif.; Astoria, Ore.; and Olympia, Wash., men are working the year 'round to keep these ships in condition. ★ ★ ★

Ships at Wilmington, N. C. were knocked out of line by Hurricane Hazel in 1954

Norfolk U.S. Naval Air Station photo





Acid waters of Lake Alma are "sweetened" with hydrated lime. Lime is mixed with water, sprayed from boat



Two men with electrodes and two with nets stun fish in Little Miami River. "Trash" fish are taken from water
Portable weed cutter installed on a rowboat can restore about eight acres of overgrown fishing water per day





Biologists tag three-foot muskie in Rocky Fork Lake. Recovery of tag later reveals growth and travel habits

Better Fishing Ahead!

By Erwin A. Bauer

IN RECENT YEARS, Ohio fishermen have become accustomed to seeing uniformed men engaged in strange activities along local waterways. These men are aquatic biologists of the Division of Wildlife whose business is to provide better fishing—no simple matter in a highly developed state that boasts more than a million anglers, only limited available water and, in places, a bad pollution problem.

To do the job, they've had to devise many curious but effective means and mechanisms. But slowly the effects of their work are being felt in the creels of the state's grateful fishermen.

In many lakes across the state there are actually too many fish—usually panfish stunted by overcrowding and such undesirable species as gizzard, shad, carp and the like. Every conceivable means has been used to remove these unwanted specimens.

Whole Lake Poisoned

One lake—Guilford—was completely poisoned. The fish were removed, ground up and returned to fertilize the water. When the water was pure again, the lake was restocked with game fish like bass and bluegills. Last year fishing there was excel-

lent. Elsewhere only the spawning beds of panfish have been poisoned, to cut production and to prevent stunting before it could happen.

Acid wastes from abandoned coal mines completely sterilized another lake—Alma, in southern Ohio. After most of the mine openings were sealed, biologists "sweetened" the lake with applications of hydrated lime until it could be stocked again.

(Continued to page 250)

Muskie eggs are cared for during hatching by gentle agitation with a feather. Clean water runs through jar





Coils of fence wire weighing 50 pounds each are placed on bomb racks under plane wings and fuselage



Plane flies low over fence line in New Zealand's hill country, dropping the bundles at intervals

Fences Drop From Air On New Zealand Farms

New Zealand is an agricultural country that farms from the air, but so much seed and fertilizer have been sown by plane since the war that a new problem has arisen. Farmers can't cope with the new land coming into production and their biggest headache has been fencing. So now airlift tactics are used to speed up fencing.

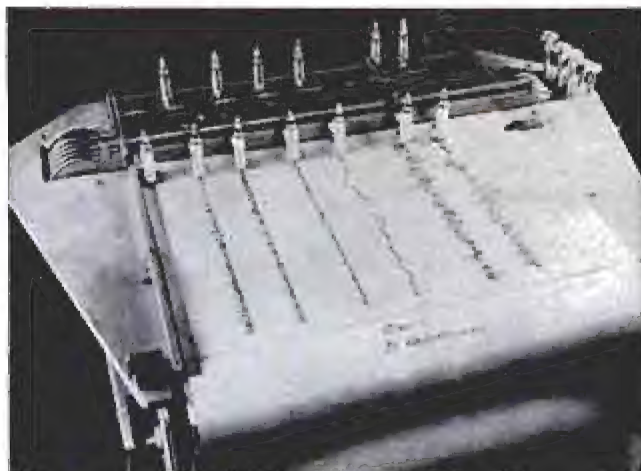
Chief Soil Conservator Douglas A. Campbell has invented a method that saves time and money—delivering the fence by air in prepacked bundles, dropped right along the line of the new fence. Galvanized steel posts are bound together in bundles that burst on impact with the ground to prevent damage. Coils of wire are wrapped on wooden cores or old drums and loosely roped to prevent uncoiling. Bundles are attached to bomb rack under plane's wing.

When fence is erected, special tool is used to pull wire tight against battens to prevent "chatter"



Snow Chutes Load Trucks

Relieving flat roofs of the cumulative weight of winter snows is accomplished in Austin, Nev., with the aid of chutes projecting from the front of a building. Trucks are parked directly under the slides and snow shoveled into the top of the slides goes directly into the trucks. During torrential desert rains the slides serve to divert excess water that cannot be handled by the conventional drain spouts.



Riding comfort and safety on the German Federal Railway are checked by an inspection car that determines how true the tracks are. Measuring units that ride the rails before and behind transmit information to a graph-making instrument inside

Rail-Measuring Car

the car. The graph reveals any irregularities in distance between the rails, straightness of the track, height of rails and degrees of a curved track. The diesel car has a road speed of 37 miles per hour, but runs at 12 miles per hour while on the job.



Correct Flash Exposures Automatically Computed

Called "Flashometer," a unique device assists amateur photographers in rapidly computing correct flash exposures. The photographer sets an index number determined by the type of film and size of bulb, then sights through the instrument for alignment on the subject. He then refers to a scale which automatically gives him both the correct exposure setting and the distance to the subject. A single dial and an easily read scale make for simple operation.

Next Aviation Hazard—The Disintegration Barrier

With aircraft through the sonic barrier and on the threshold of the thermal barrier, scientists are tackling the third—the disintegration barrier. Early research indicates that known metals "sputter away" or disintegrate when bombarded by ionized particles moving at 20,000 miles per hour. Testing is done in a futuristic test chamber known as the Electron Physics laboratory which reproduces conditions anticipated at 80 to 300 miles above the earth. Metal is placed in the chamber, and inside pressure is pumped down to the near-vacuum of the outer atmosphere. Ionized atoms are then fired at the material, creating a condition similar to that of a spaceship traveling at 20,000 miles per hour. Atoms colliding with the material being tested knock atoms from the material's surface. The number of atoms dislodged determines the "sputtering rate" of the material.





Relief Map Shows 9000 Square Miles Around San Diego

Nine thousand square miles of area around San Diego, Calif., is portrayed by a relief map that weighs 1500 pounds and covers elevations between minus 4000 feet and 8735 feet above the sea. Made in eight sections, it measures 8 by 17 feet. The relief map begins 23 miles offshore from San Diego and climbs steeply to the crest of Mount Toro, about 90 miles northeast of San Diego. Elevations are represented by one inch to 800 feet. Horizontal distances

are on a scale of 1 to 42,000. The map is colored by sand and crushed rock worked into the Spackle used for the map's surface finish. The Pacific Ocean and the Salton Sea are depicted by sinks covered with blue-tinted glass. Small light bulbs, each activated by a marked push button, designate each town. The map, located in the office of a San Diego newspaper, is expected to prove valuable in studies of population growth, water and transportation problems.

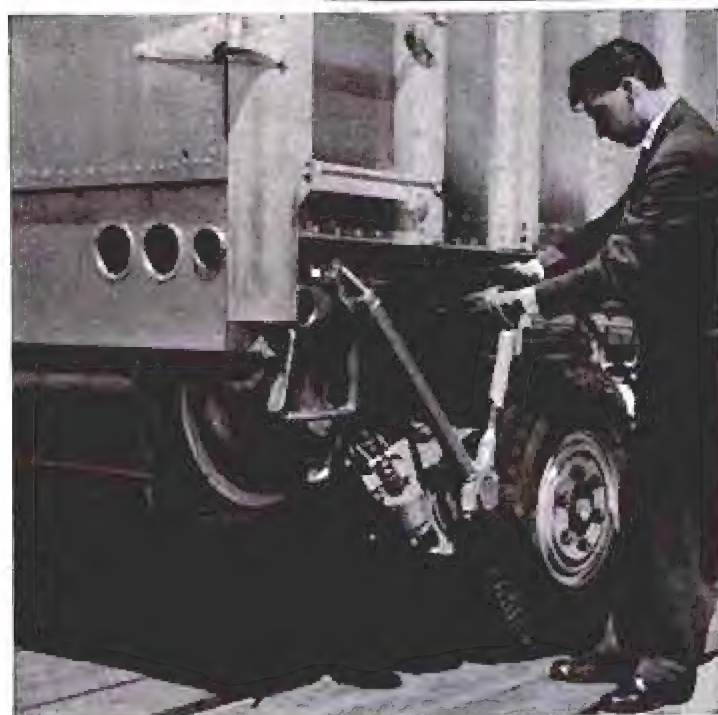
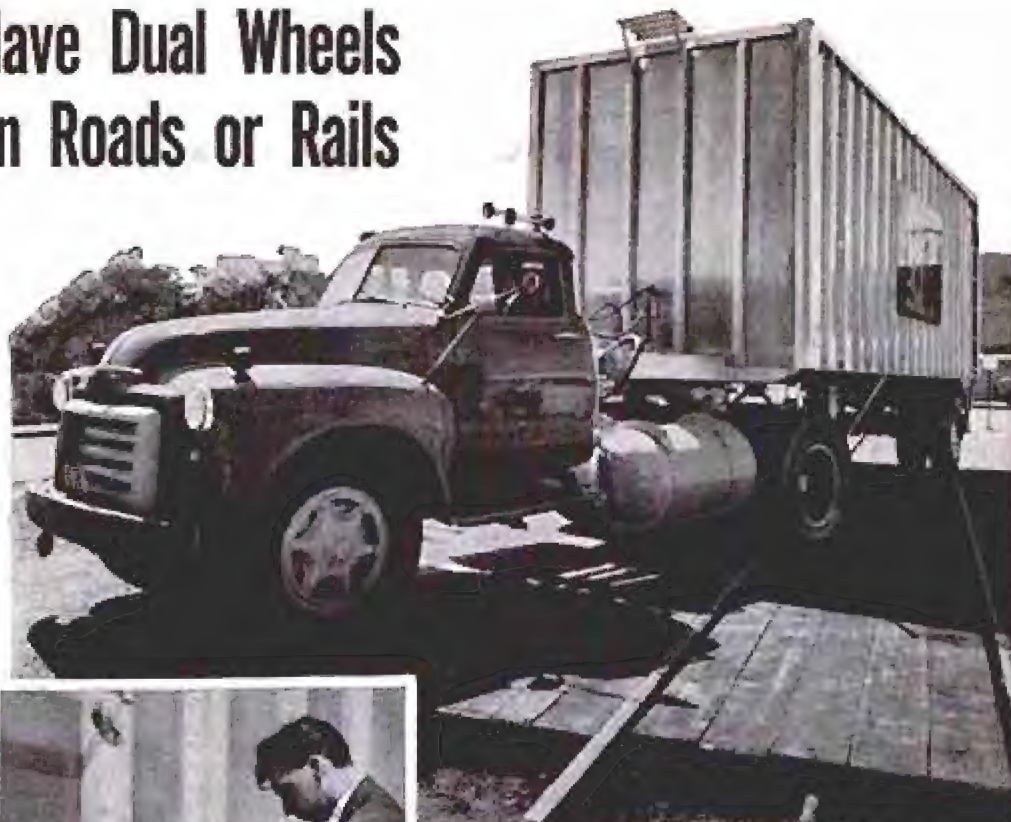


Aluminum Catamaran Sails Hawaiian Waters

Aluminum, not plywood, forms a seaworthy catamaran built by industrialist Henry Kaiser for pleasant cruising in Hawaiian waters. Because of its weight, the metal craft has projections on each side of the ship which serve as outriggers to keep the boat from turning over in heavy seas. The projections make excellent catwalks and observation platforms for guests. From the crawl spaces inside the ship, one can get out on deck through portholes. Watertight bulkheads prevent flooding in case of a break in the hull.

"Railvans" Have Dual Wheels For Travel on Roads or Rails

Trailer is loaded at shipper's dock, then hauled by truck to the rail siding. "Railvan" combines flexibility of truck transport with "long haul" economy of shipment by rail



HIGHWAY TRUCKS and freight cars are combined in the Chesapeake and Ohio's new "Railvans." A truck tractor hauls the semitrailer unit to a rail siding, where standard rail wheels are lowered to the tracks. The rubber-tired wheels retract for the ride behind a locomotive to the destination city.

When one set of wheels is in position, the other is retracted. Below, the lead Railvan of the train rests on a set of adapter wheels which couple it to the locomotive





Normal living-room lighting was supplemented by one RFL No. 2 lamp bounced from corner. Shot at $f:4$, $1/50$

*Superfast films are revolutionizing photography
for the amateur. Now you can take*

INDOOR PICTURES WITHOUT FLASH

Photographs by Bob Schwalberg

Pennsylvania Station, New York City, at night, made at $f:2.8$ and $1/50$, developed in Microphen for 26 minutes



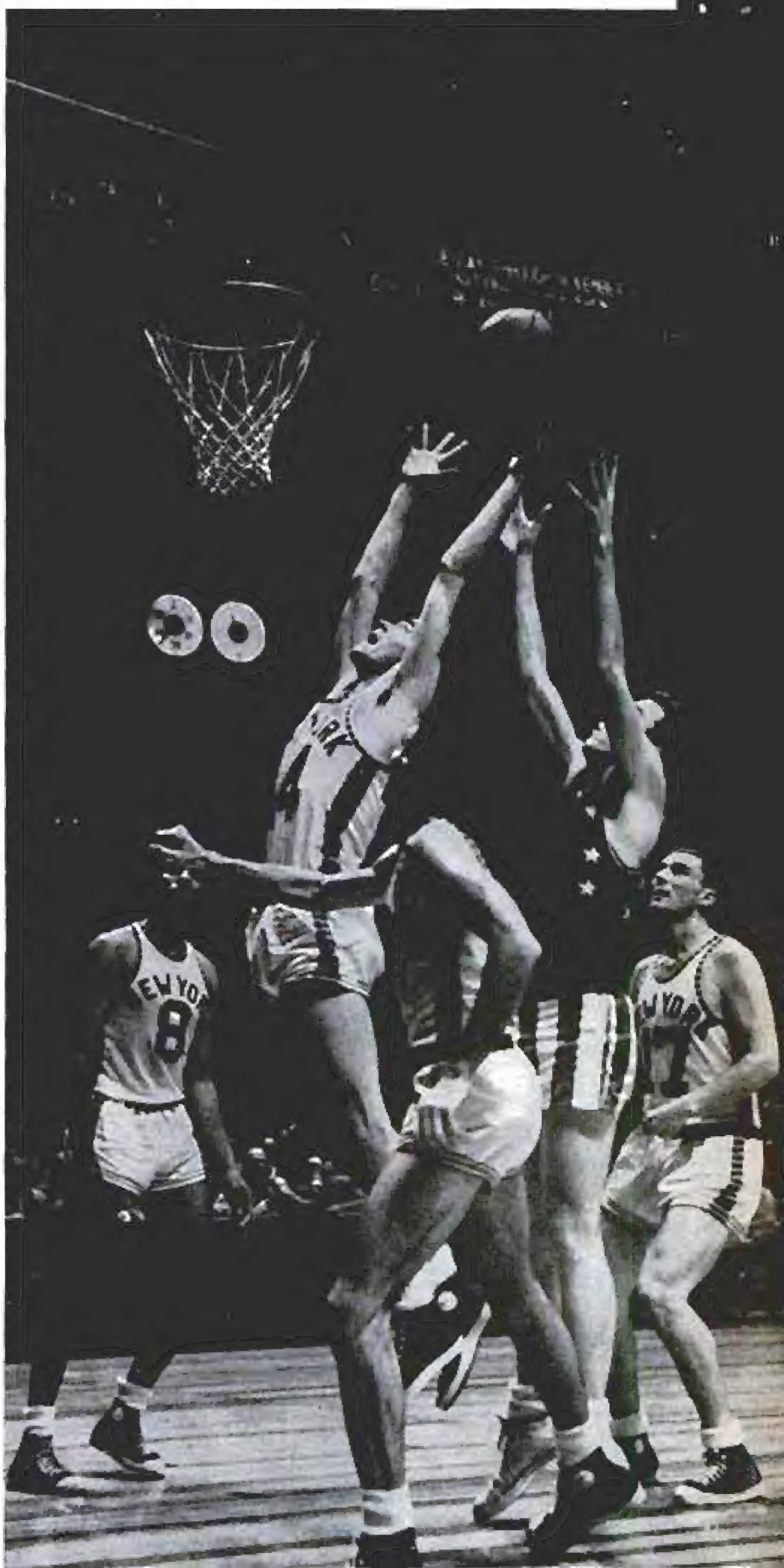
THERE'S BEEN a revolution in photography in the past year—a noiseless, nonviolent upheaval that has rewritten all of the old rules on how to get good pictures. The cause of all this tumult was the introduction of the amazing new “superfast” films, such as Kodak Tri-X, just over a year ago.

The results of this revolution are evident all over the country. Pictures are now being taken indoors without flash—using only available light. Owners of cameras with moderately fast f:3.5 and f:4.5 lenses are taking the very same pictures that once needed very expensive f:1.5 and f:2 lenses for shooting. Such brightly lighted indoor spots as airline terminals, banks and supermarkets are now fair game for a photographer looking for unusual pictures. Even owners of the ubiquitous box camera are getting into the act, shooting pictures on cloudy and dark days or indoors with available light that were impossible before. The superfast film, however, is not recommended for outdoor work with box cameras in bright sunlight; pictures under such conditions are likely to be badly overexposed.

What is this Tri-X, that it can do so much for a camera? It's a highly sensitive, medium-fine grain, fully panchromatic black-and-white film, with an ASA speed rating of 200 daylight and 160 for tungsten lamps. Its predecessor, Super XX, was only half as fast, yet Tri-X has equal or less graininess—which means that Tri-X's extra speed is achieved without any sacrifice of pictorial quality.

Commercial photographers say that Tri-X comes close to being an

Action in basketball game at Madison Square Garden, New York City, caught on Tri-X film. Exposure was 1/500 at f:4 with a 50 millimeter lens. Only available light was used. Developed in Promicrol for 16 minutes





At left, circus shot through a 200-millimeter lens with 35-millimeter camera. Exposure 1/100, f:6.3. Above, bouncing boy caught at f:2.8, 1/500. One photoflood was used

all-purpose film, with a flexibility that is amazing. For example, pictures of indoor sporting events, with older types of film and available light, had to be shot with a relatively wide lens opening and slow shutter speed—and often even a flash was little help. At a basketball game, the flash would merely light the foreground and leave the rest of the picture area dark. But now the superfast film permits a smaller lens opening for the light available—which gives greater depth of field—and allows shutter speeds fast enough to stop the action on the court. The photographer can get a dramatic picture in available light with uniform lighting all over the picture.

The new film has industrial applications, too. For example, an automotive manufacturer who takes frequent pictures of his assembly line can get his pictures quickly and conveniently in available light without distracting the workers by using the new film—where formerly 40 to 200 flash bulbs had to be



Picture on Times Square, New York City, made at f:4 and 1/50, shows ability of Tri-X to penetrate dark areas

synchronized to make satisfactory exposures.

And at home the new film has important plus factors. The father of a new baby can now take appealing snapshots of his offspring without using artificial lighting aids. No time need be lost in elaborate lighting preparations, and the pictures will be softer and more natural than those shot with

flash or photofloods. Cute, unposed pictures are easier to get, and the infant doesn't have to be startled by the sudden brilliant flash of lights.

While the new film often eliminates the need for flash, there are times when the two can be combined most effectively. At a prize fight, for example, with the new film and flash a photographer can freeze

Character study shot in very bad light using f:2 and 1/25 second. Developed for 12 minutes in D-76





Another circus shot with a 200-millimeter lens. Exposure was 1/100 at f:6.3. Developed in D-76 for 13 minutes

the fastest action in the ring. Since he can stop down his lens, he may have enough depth of field to catch the action whether it is right over him or on the far side of the ring. Some very dramatic knockout-punch pictures have been caught using this combination.

And because of the flexibility of the film, he can capitalize on all the picture opportunities around him. Light conditions can vary sharply, yet he can still get his picture. And with the good depth of field permitted by superfast film, focusing is less critical.

Professional photographers say that good as a Tri-X negative made in bright sunlight is, it will never be as good as one shot on a medium-speed, general-purpose

film such as Kodak Verichrome Pan. A high-speed film such as Tri-X should be used to do the job for which it was designed—to take good pictures under poor lighting conditions. Shooting with Tri-X in bright sunlight is like hunting for jack rabbits with a howitzer. But when a soldier needs a howitzer, it's mighty effective—and so is Tri-X.

For best results with Tri-X, use a light meter before shooting and develop according to recommendations. If you haven't a light meter, the chart on this page gives average lens openings and shutter speeds to guide you.

Set the light meter for a film speed of 200 for outdoors or 160 under tungsten

(Continued to page 244)

Charts below are intended as guides for beginner using Tri-X film. Experience will soon teach best methods

GENERAL INDOOR ILLUMINATION EXPOSURE CHART FOR USE WITH TRI-X

Shutter Speed	Average dim indoor locations with sufficient light to read newsprint easily.	Average bright indoor locations in homes and offices with fairly light-colored walls and ceilings.	Very bright indoor locations such as fluorescent-lighted supermarkets, theater marquees, etc.
1/5 sec.	f:5.6 to f:7	f:8 to f:10	f:11 to f:16
1/10 sec.	f:4.5 to f:5.6	f:5.6 to f:7	f:8 to f:11
1/25 sec.	f:2.8 to f:4	f:4.5 to f:5.6	f:5.6 to f:8
1/50 sec.	f:2 to f:2.5	f:2.8 to f:4	f:4 to f:5.6

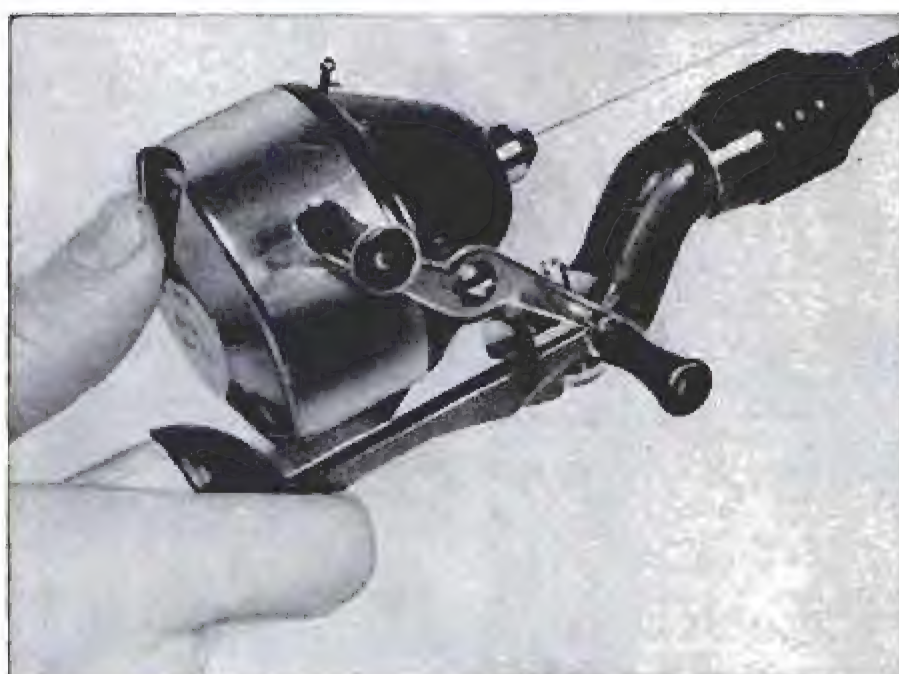
GENERAL EXPOSURE AND DEVELOPMENT CHART FOR TRI-X FILMS

ASA-Calibrated exposure meter set at	Kodak Formula D-23	Kodak Developer D-76	May & Baker Promicrol Developer	Ilford Microphen Developer
400 to 500	12-13 min.	8-10 min.	7-9 min.	not recommended
650 to 800	not recommended	11-13 min.	10-13 min.	12-15 min.

All developer temperatures should be 68-70 degrees Fahrenheit. Film should be agitated for about 5 seconds after each minute of elapsed time. Tri-X should be given 10 to 20 percent more hypo time than manufacturer of fixer recommends.

Folding Dinghy Made of Canvas

When not in use, this British-made dinghy folds so compactly that it can be carried easily under the arm. The boat, made of canvas and leather, is held open by wooden seats that fit into slanting grooves. Available in three lengths—6, 7½ and 8½ feet—it will accommodate two or three adults. The largest model is rugged enough to take a five-horsepower out-board motor.



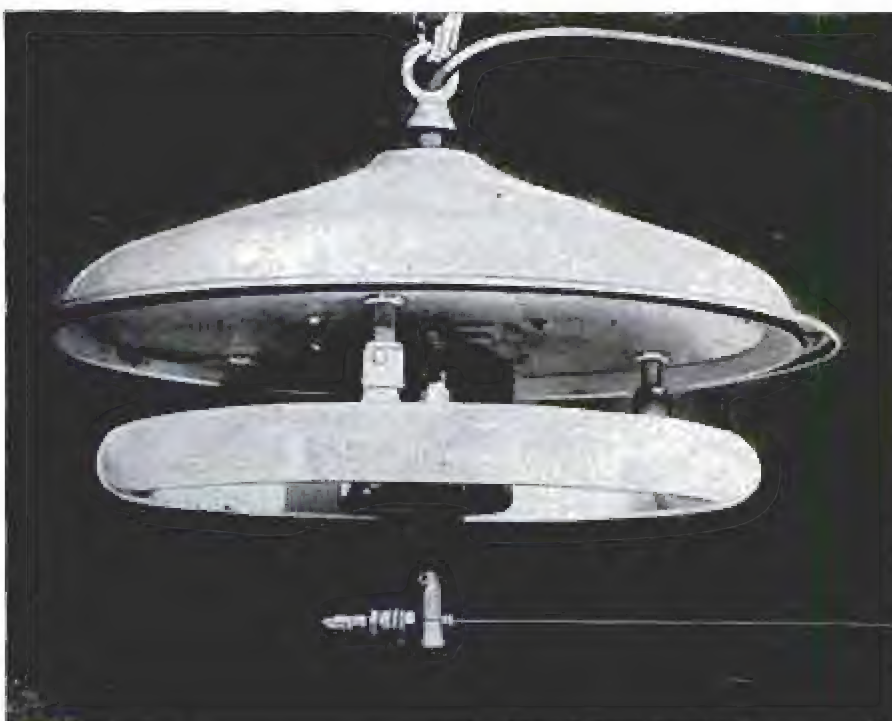
Spinning Reel Can Be Thumbed

Advantages of both spinning and bait casting are combined in a new fishing reel. The spool of the spinning-type reel is at the back. The housing for the spool has a thumb hole which permits thumbing of the line in much the same way that a bait-casting reel is controlled. The line is released by removing the thumb, and the cast is stopped by thumbing the line itself, giving the angler manual control over the cast.

Bug Whipper Mounts on Lamp

Insects attracted to the circular fluorescent tube of an antibug device are struck and killed by a whirling metal wand. The wand is mounted on the shaft of an electric motor that hangs from the reflector of the lamp. Its humming helps attract mosquitoes and other harmful night-flying insects.

☐ Scheduled airlines operated about 20,000 trans-Atlantic flights during 1955, carrying some 692,000 passengers.





Rested and rarin' to go, this dog leaps from his two-compartment all-steel trailer. Springs make riding easy and mesh provides ventilation

Photos by George Laycock

"Pullmans" for Hunting Dogs

SPORTING DOGS are usually traveling dogs and they ride in an endless variety of "Pullmans" going to and from bench and field trials and hunting areas. Owners are always on the lookout for better dog-hauling vehicles or crates because a dog's comfort en route has a lot to do with his performance in the field. A dog must have room enough to turn around and lie down comfortably. He needs a bed, usually straw, and plenty of fresh air. Some owners use special ventilators. Dogs need protection from rain and snow and if they are used to separate compartments at home it is a good plan to haul them in privacy on the road. Some owners have elaborate trailers that are actually portable kennels. ★ ★ ★

Aluminum dog crates fit easily in the back of this station wagon. Crates are lightweight but sturdy



Single-wheel trailer is easy to handle and the open sides afford lots of fresh air on long journeys

Proud owner's golden retrievers ride in this custom-made crate that fits in the rear of station wagon





Homemade aluminum box serves as a crate for travel and a kennel at home. When traveling, doors are put on houses. Exhaust extensions protect dogs en route



Plywood box converts the trunk of this car into a hauling crate. The wire is one by two-inch turkey wire. Crate accommodates two or three large dogs



Simple canvas-covered framework converts this pickup truck into a dog "Pullman." Dogs have straw bed

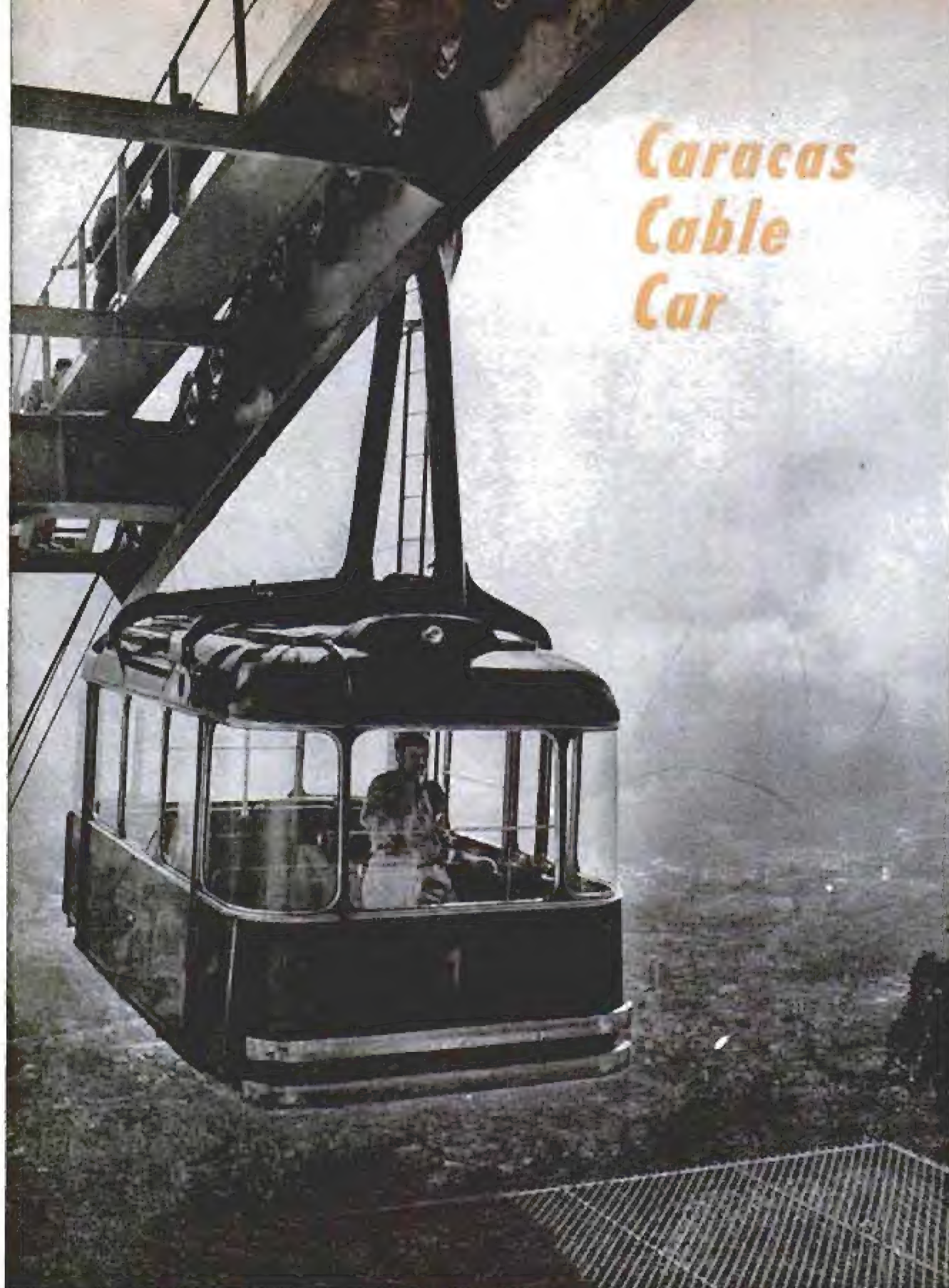


Wire mesh partition in station wagon has a frame of half-inch pipe. Entire rear section becomes a crate

Lucky golden retriever at field trial leaps into a portable kennel that has all the comforts of home including a "kitchen" and "bathroom" (tub) in rear



Caracas Cable Car



SIGHT-SEERS can now travel in ultra-modern cable cars from Caracas, Venezuela, to the top of 7000-foot Mount Avila. There they can enjoy an unsurpassed view of the city on one side and the blue Caribbean on the other. When the \$15,000,000 project is completed, the cableway will extend up the side of Mount Avila, from Mount Avila to two adjoining mountain

peaks and from Mount Avila down the other side of the mountain to the Caribbean. This, it is said, will make it the world's second longest cable-car system. A mountaintop 14-story circular hotel and an ice-skating arena are also included in the project, which is expected to attract visitors from all over the world. Tours on the run started in February.



Garden Tractor Serves as Truck



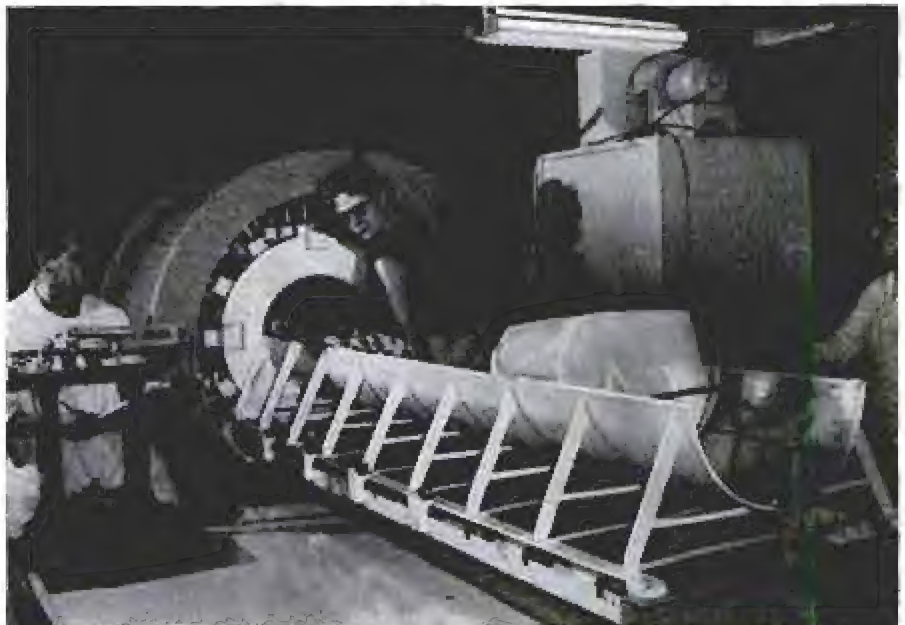
Many kinds of work are performed by a garden tractor that can serve as the power unit for a small field truck. In this application, the basic unit is mounted on an axle fitted with two driving wheels and acts as

a tractor to which the car is attached. It can carry loads of up to 880 pounds. The unit also serves as a two-wheel mower, plant-hole driller, plow and can be used to pull trailers or other equipment.

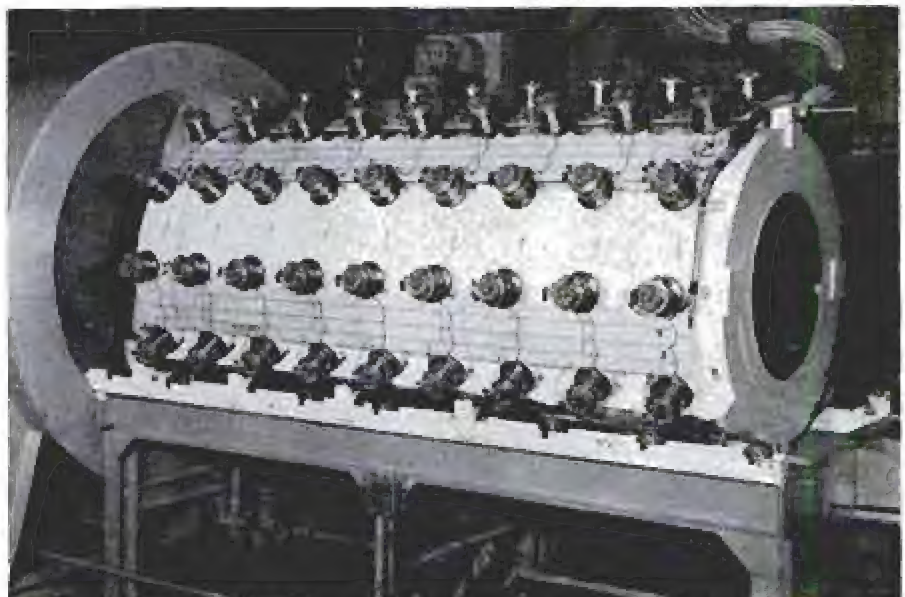
"Geiger" Tank Checks Entire Body

With an elaborate tank-like instrument, scientists at Los Alamos Scientific Laboratory can measure the total radiation present in a human body. The subject, lying in a trough, is pulled inside the tank. Sealed in the hollow walls of the tank are 140 gallons of a liquid which emits tiny flashes of light when gamma rays pass through it. These flashes are detected and amplified by 108 photomultiplier tubes in the outer shell of the tank. Thus the instrument measures all the radioactivity present in any part of the subject's body. The study of natural body radioactivity became necessary when scientists sought to determine precisely how much exposure is possible in a human without damage.

⌚ Clogged sink drains and overflowing septic tanks are cleared by introducing a fluid containing enzymes that break up greases and reduce them to harmless amino acids.



Los Alamos Scientific Laboratory photo





Parts of storage room are cut, shaped and drilled, all ready for assembly with pliers and screwdriver



Side of room is made up of three sheets of aluminum. The roof rafters are preassembled to minimize work



Portable Storage Room Erected in Six Hours

One man can erect a new build-it-yourself storage room in his backyard in four to six hours, using only a pliers and screwdriver. Made of aluminum, the room provides extra storage space, or can be used as a tool shed, a work shop or a playhouse. Size of the completed house is eight by ten feet, six feet high at the rafters. The only thing not provided in the package is a four-inch concrete slab to serve as flooring. Windows can be incorporated in the room at a slight extra cost.

Chain Pulled Taut Serves as Camera Tripod

Unlikely as it may seem at first, a length of lightweight chain is now being marketed as a camera tripod. A fitting on the top of the chain screws into the tripod receptacle on the camera. The photographer then steps on the lower end of the chain and pulls the camera upward until the chain is taut. The manufacturer claims that as long as the chain is kept taut, the camera will be steady. When used with a movie camera to make pan shots, the body is swung at the waist as the camera is moved from side to side.

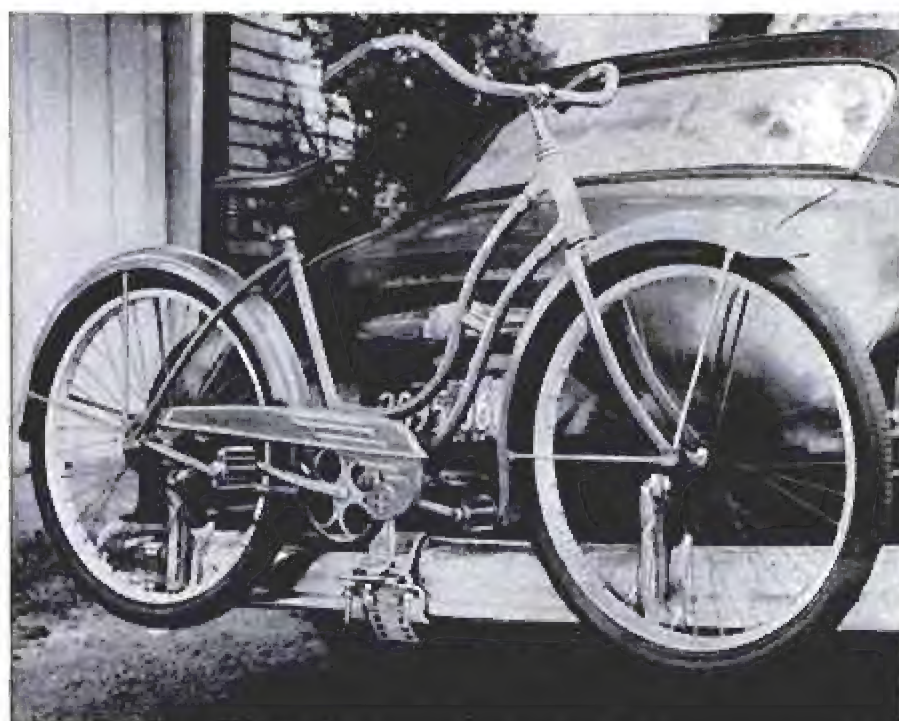
Antidote for Nerve Gases

Development of an effective antidote against deadly nerve gases has been announced by a team of Columbia University biochemists. Called PAM, an abbreviation of its complicated chemical formula, the antidote has worked on 100 percent of the animals used in tests, where they were exposed to doses of gas which would normally have killed them in five minutes.



Tiny Helicopter Carries One Man

Service-station operators will have to watch not only for cars but also for helicopters pulling up at the pumps when a one-place helicopter nicknamed the Sky Scooter goes into production. Cruising at 60 miles per hour, the little ship carries fuel for two hours of flight in its portable tank. It is equipped with a 40-horsepower air-cooled engine which drives small propellers mounted on each rotor blade.



Clamp on Bumper Holds Bicycle

For interesting side trips, take your bicycle along on your next automobile trip. It's easy, now that a special clamp that fits on a car bumper to hold the bike is available. Once the clamp is fastened to the bumper and an inconspicuous pintle is attached to the bicycle, it takes only seconds to mount the bicycle on the bumper. The carrier holds any size of bicycle.

An inconspicuous pintle that is permanently attached to the bicycle fits over clamp on bumper

Nylon "Doughnuts" Float Helicopter in Emergency Landing on Water

Finding himself faced with an emergency landing over water, a helicopter pilot whose whirlybird is equipped with flotation gear just pushes a button. This releases compressed air, and within five seconds a large doughnut-shaped float inflates over each wheel. The four floats can support a 7200-pound Sikorsky S-55 helicopter with 100-percent reserve buoyancy. The flotation gear is approved by the Civil Aeronautics Authority.

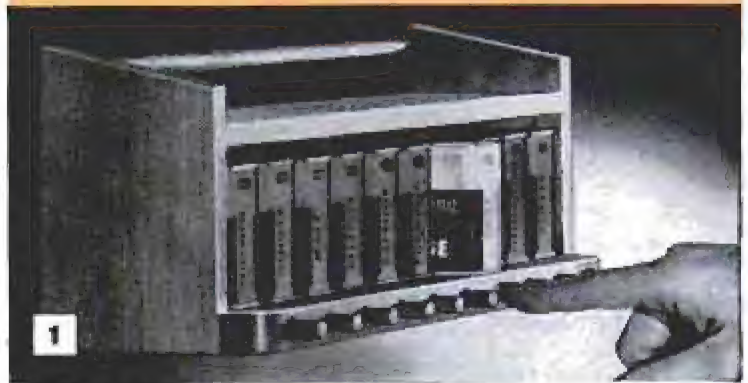


WHAT'S NEW FOR

YOUR HOME



2



1. PUSH-BUTTON SPICE RACK holds 10 standard-size spice cans with edges to front. Push one of the 10 buttons and can above it pops out. Shelf above holds knickknacks
George S. Thompson Corp., 509 Mission St., South Pasadena, Calif.

2. LOG CART used to haul wood for the fireplace also serves as an attractive holder for logs once they are inside. The cart has six-inch wheels to make it easy to pull up and down steps as well as on horizontal surfaces. Curved tray that holds the logs is solid brass and 18 inches wide

Leavenworth Steel Inc., First and Walker, Kansas City, Kans.

3. SELF-FEEDING TOOTHBRUSH carries a liquid dentifrice in its handle, which is replaced when empty. Shaking the handle forces a few drops of the concentrated liquid dentifrice into the base of the bristles
Amity Sales Co., 711 S. Orange Ave., Newark 6, N.J.



4. FLUSHING GUN blasts drains clear. Pumping the handle builds up air pressure until trigger is pulled to shoot air blast down the lavatory, toilet or floor drain. Hose connected to faucet feeds water to gun
Miller Sewer Rod Co., 4642 N. Central Ave., Chicago 30





5. POP-UP OVEN elevates at push of a button to ease handling of food. Lowered, it serves as a work surface that can be adjusted to any convenient height. Oven, with wall controls, is a self-contained unit

Philco Corp., Philadelphia, Pa.

6. COMBINATION UNIT employs one 300-watt motor built into counter top to power food mixer, blender, juicer and knife sharpener. Motor adapts to six different speeds. Unit reduces kitchen clutter

McTear, Inc., Madison and Red Bank Bks., Cincinnati 27, Ohio

7. ELECTRIC SMOKER burns hickory chips placed on heating element at a low, even temperature that prevents flare-ups and scorching. The portable unit has removable shelves and a sliding, smoke-tight door

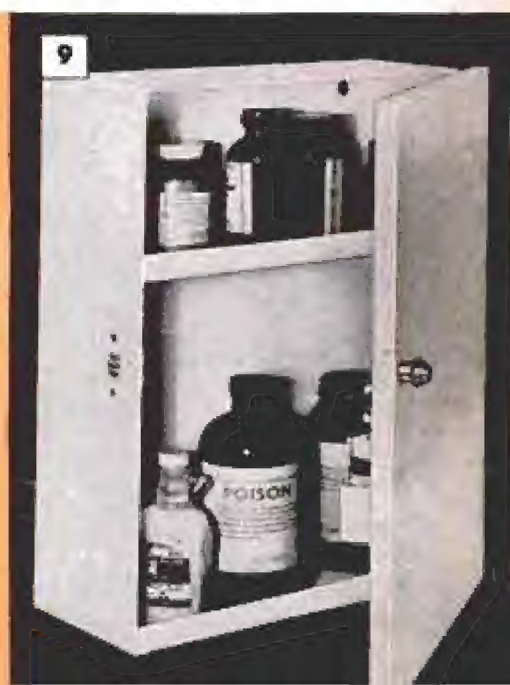
Red Echo Metal Products, Quincy, Ill.

8. DEEP-FAT THERMOMETER, clipped to side of frying basket or cooking pot, assures crisply fried foods. A danger zone on the end of the 200 to 400-degree scale warns the user to lower flame

Cooper Thermometer Co., Pequotuck, Conn.

9. CHILDPROOF MEDICINE CABINET has a three-dial combination lock to prevent small children from reaching poisons and strong medicine stored in it. White-enameled chest is easily hung from screws

Tot-Safe Co., Durham, Conn.



OWNERS REPORT:

CONTINENTAL MARK II



WHAT IS IT LIKE TO OWN A \$10,000 CAR?

So outstanding it's annoying

"So outstanding that everyone stares. People are constantly trying to catch up and pass to get a look. That is sometimes annoying."

NEW YORK SALESMAN

Thrill like very first car

"I feel like I never had a car before. It's the same thrill I got from my very first car and I've been driving since 1930."

CALIFORNIA HOUSEWIFE

Always stylish

"I like the undated aspect. It's a car that will always be in style because of good basic design."

NEW JERSEY FUNERAL DIRECTOR

Think it's foreign

"Fabulous beyond words. Many people do not know what make it is. Most think it is foreign made. We just love it."

MONTANA RESTAURANT OWNER

Requires agility

"A man has to be old to be able to buy one and young to be able to get in and out of it."

FLORIDA RETIRED OWNER

Everything average but price

"Hardly think anyone would buy this car except for prestige. It's hard to get into. Uncomfortable in the back seat. No particular speed. Everything very average except price."

ARKANSAS EXECUTIVE



By Owners of the Mark II

RATHER THAN having the feeling of riding, you experience a floating sensation. It is absolutely the dream car of today." That's what a Texas oil operator says about his Continental Mark II.

And his lyrical description of the ride is similar to that of other owners. Riding comfort is, in fact, the top-ranking best-liked feature, with 40.6 percent of the Continental owners who filled in our questionnaires listing it. The questionnaires were sent to 750 owners—about half of all Continental owners when the survey was made.

"Quiet. Just floats down the highway."
—Indiana investor.

"Feeling of gliding instead of rolling."
New York artist.

"I have just returned from a seven-day 3000-mile trip through New Mexico and Colorado, a trip I have made many times in other high-price cars. This trip in my Mark II was the most comfortable I have ever made."—Texas furniture manufacturer.

Mark II owners do like their cars. But, you may be saying, they should! After all,

(Continued to page 148)



CLYMER DRIVES THE MARK II

By Floyd Clymer

MY TEST of the Mark II was from Los Angeles to Fresno, across the mountain range to Salinas, down the Pacific Coast Highway through Santa Barbara, a few speed miles on a dry lake bed and some

back-road tests in the Mojave Desert, totaling 817 miles.

The handling qualities of the Continental are a combination of those found in sports, foreign and American cars. It has the road "feel" of the semisports car and handles

(Continued to page 236)

AN ENGINEER *Analyzes the* MARK II

By Dale Kelly, SAE



ACCELERATION TIME IN SECONDS

	0 to 20	0 to 40	0 to 60	0 to 80	1/4 mile
Ignition timed for regular gasoline	3.3	7.6	14.4	23.7	20.3
Ignition timed for premium gasoline	3.3	7.3	14	22.9	20.1

(The watch was started at the instant the accelerator was floored. The engine was not run up against the brakes before the start. All tests were in Drive range.)



FUEL ECONOMY MILES PER GALLON

	Steady 50 m.p.h.	Steady 70 m.p.h.
Ignition timed for regular gasoline	14.7	11.5
Ignition timed for premium gasoline	15.4	11.5



SPEEDOMETER ERROR (MILES PER HOUR)

Indicated speed	20	30	40	50	60	70	80
True speed	19	29	39	50	60	70	81

ODOMETER ERROR

The odometer was correct within 1/2 of 1 percent.



DRIVER'S VISION

Some portion of the road could be seen 15 feet in front of the car (A in sketch) by an average driver (5 feet 9 inches tall); full width of the road could be seen 23 feet in front of the car (B in sketch).



GROUND CLEARANCE

The bottom corner of the rear overhang would touch the ground if the car were driven through a dip whose profile had a radius of curvature of less than 27 feet (solid line in sketch). The center of the car would drag if the car were driven over a hump with a radius of less than 23 feet (dotted line in sketch). The frame would drag if the car were driven in ruts deeper than 8.5 inches. The doors would open over a 13-inch curb.

MISCELLANEOUS

OCTANE REQUIREMENT

On an 85-percent-octane blend of octane and heptane, equivalent to typical regular gasoline (octane 82 Motor, 88 Research), the engine ran without knocking at a basic ignition timing of 9 degrees before top center; on a 90-percent-octane blend it ran without knocking at 12 degrees. The acceleration and fuel economy listed above for regular and premium gasolines were obtained at these settings. Ignition timing more than 12 degrees before top center did not produce any further improvement in performance.

At the time of the test the car had a 12,000-mile accumulation of carbon. Another car of the same make and model could easily have an octane requirement several points higher or lower.

STEERING

The steering wheel turned 3.75 turns from lock to lock. The steering-wheel diameter is 17 inches.

the car does cost \$10,000 and for that money it should be good. The owners agree.

"It's a lot of automobile, but it's a lot of dough. Even with hand assembly, a lot of minor annoying adjustments are necessary."—Illinois engineer.

"An outstanding car, but there is a question whether it is worth \$10,000 if performance and reliability are to be the criterions. Entirely too much time in the shop having small things fixed."—Colorado publisher.

But such complaints are infrequent. In

Model tested: 2-door hardtop with power steering, brakes, seats and windows, and optional air conditioning. Rear-axle ratio: 3.07 to 1. Wheelbase: 126 inches. Tires: 8.20x15, four ply. Curb weight: 5200 pounds with gas tank half full (54 percent of weight on front wheels, 46 percent on rear). Barometer: 28.82 inches; temperature: 90 degrees F. Payload: 400 pounds for acceleration tests, 200 pounds for fuel economy.

TRUNK CAPACITY

In addition to the spare tire and the tire-changing tools, the trunk could accommodate seven cardboard cartons of the size used for 48 tall cans of evaporated milk.

HEIGHT OF CENTER OF GRAVITY

The center of gravity of the unloaded car was 22.5 inches above the ground.

VENTILATION

The ventilating air inlet was low at the front of the car, where it would be likely, in heavy traffic, to take in exhaust gas from the car ahead.

NOTE: Certain data were not obtained in this test of the Continental because of circumstances beyond the control of the tester. The test car was obtained through the courtesy of Mrs. Willie Zimmermann of San Marcos, Tex., who kindly consented to let her personal car be used. Thanks are also extended to Maddox Motors, New Braunfels, Tex.

the survey, the Continental comes out very well indeed. Here are some quotations that describe how owners feel about their \$10,000 cars:

"There's the luxurious feeling of driving a beautifully engineered and designed automobile."—Illinois salesman.

"I have always wanted the best car I could find. A Rolls-Royce with a little more style, a little more zip, a little less stodgy. I am just satisfying a 40-year desire for the best."—New York retired owner.

Continental owners in 40 states (in color) tell you what they think of their cars in this Owners Report

THE OWNERS ANALYZE THE CONTINENTAL MARK II



EXCELLENT	AVERAGE	POOR
74.7%	19.2%	6.1%
(When its price is considered)		

Had trouble with engine?
 No trouble.....81.6%
 Some trouble.....15.5%
 Considerable trouble.....2.9%

What was engine trouble?
 Oil consumption.....3.9%
 Carburetor.....2.9%
 Hard to start.....2.4%
 Ignition.....1.9%

Had trouble with body?
 No trouble.....60.4%
 Some trouble.....27.0%
 Considerable trouble.....2.9%
 No answer.....9.7%

What was body trouble?
 Body noises.....9.7%
 Water leaks.....9.2%
 Electric windows.....8.2%
 Door operation.....3.9%

Would like faster acceleration?
 Yes.....18.4%
 No.....78.7%
 No answer.....2.9%

Would like more top speed?
 Yes.....5.3%
 No.....78.8%
 No answer.....15.9%

Would like more maneuverability?
 Yes.....8.2%
 No.....83.6%
 No answer.....8.2%

Is it the most comfortable car?
 Yes, it is.....87.4%
 No, it is not.....12.6%

What influenced your purchase?
 Exterior styling.....88.9%
 Prestige value.....60.4%
 Mechanical features.....58.9%

Best-liked exterior feature?
 Plainness, absence of chrome.....45.7%
 Lowness.....14.7%
 Long hood.....9.4%

Least-liked exterior feature?
 Spare-tire bump.....9.4%
 Extra-wide doors.....2.4%
 Short trunk.....2.0%

Best-liked interior feature?
 Leather upholstery.....38.0%
 Digitized dashboard.....11.4%
 Steering-wheel position.....3.3%

Least-liked interior feature?
 Location of driver's ash tray.....7.8%
 Hard center portion of seats.....4.5%
 Hump in center of floor.....3.3%

Who are Mark II owners?
 Have own business.....23.2%
 Executives.....21.0%
 Retired.....10.5%
 Surgeons, physicians.....9.4%
 Bankers, financiers.....7.9%
 Salesmen.....2.6%
 Ranchers, farmers.....2.6%
 Attorneys.....1.5%
 Unspecified.....16.4%
 All others.....4.9%

What did they trade?
 Cadillac.....27.3%
 Lincoln.....26.2%
 Other Ford product.....8.2%
 Other GM product.....5.0%
 Chrysler Corp. product.....4.1%
 Others, no answer.....4.9%
 No trade at all.....24.3%

How was it delivered?
 In excellent condition.....65.2%
 In above average condition.....13.7%
 Average condition.....12.3%
 Below average condition.....8.8%

How is dealer service?
 Excellent.....70.1%
 Average.....20.3%
 Poor.....9.6%

Would buy from him again?
 Yes, would.....79.7%
 No, would not.....8.7%
 No answer.....11.6%

Would buy Continental again?
 Yes, would.....83.6%
 Might.....11.6%
 No, would not.....4.8%

Did own the earlier Continental?
 Yes, did.....21.1%
 No, did not.....79.9%

Best-Liked Features

Smooth, comfortable ride.....40.6%
 Exterior styling.....38.1%
 Ease of handling.....33.2%
 Power, performance.....23.4%
 Roadability.....16.8%
 Quiet operation.....14.8%
 Fine workmanship.....14.8%

Most-Frequent Complaints

No complaints at all.....36.5%
 Hard to get in and out.....19.3%
 Inadequate trunk space.....8.2%
 Service not good enough.....7.8%
 Water leaks.....7.4%
 Rear-seat room inadequate.....4.9%
 Window-lift trouble.....4.5%
 Brakes inadequate.....4.1%

What Should Be Changed?

Nothing at all.....32.0%
 Make it a four-door.....10.2%
 Enlarge trunk.....7.8%
 Make easier to get in, out.....6.1%
 Move spare tire.....4.5%

"I do not care how much I pay for a car. I demand exclusiveness, appearance, riding quality, roadability, quiet, smooth performance and economy. My two Continentals are the closest I have come to satisfying these demands."—Michigan surgeon.

For \$10,000, Complaints

The \$10,000 price tag notwithstanding, there are complaints. Those of us who drive \$2000 cars should feel better now.

By a wide margin, the most-frequent complaint (made by 19.3 percent of the owners) is the awkwardness of getting in and out of the Mark II. Many of the complainers add that this is only a minor point and one that must be put up with if the car is to be made low.

"One does have to learn to get in and out

gracefully, especially from the back seat."—Florida owner.

"A little tight for a fat man to get in and out."—Oklahoma physician.

"Too difficult to get in and out even with the door wide open. When parked, the door width is so great it not only hits other cars but the angle of opening is small. It's a car for youngsters."—Illinois executive.

"A man has to be old to be able to buy one and young to be able to get in and out."—Florida retired owner.

Second on the complaint list (8.2 percent) is the small trunk space resulting from the position of the spare tire. Those who have air-conditioned models have even less trunk space as the evaporator occupies added room.

"Trunk space is limited. I have had to

WHAT MAKES A CAR WORTH \$10,000?



Dials...knobs...on the dashboard look and feel elegant



Leather is soft, supple and tailored in good taste



Convenient fuse box has its circuits labeled in lid



Hub caps cost \$26 apiece, are assembled of 40 vanes. Below, seat backs are biscuited. Note the grab strap



YOU DON'T have to be an engineer to know that the Mark II is outstanding. It shouts quality in a quiet, gentle way.

You don't have to start the engine to sense it. Slide into the seat and feel the softness of the leather. Turn the knobs and you get the same satisfaction that comes when you handle a fine camera or a micrometer. Look at the instruments. Quietly dignified, their delicate needles look confident and trustworthy.

Drive it and you become certain this is a fine car. It is quiet—unbelievably quiet at normal road speeds. Turn the wheel and it responds as you would expect a fine car to. Its long hood and the jewelrylike ornament far in front reinforces your opinion.

On this page are a few of the reasons why the Mark II sells for \$10,000. For those who can insist on finest quality at any cost, it is a small price to pay for the luxury of knowing that they ride in elegance. For others, less fortunate perhaps, to whom a car is utility, neither it nor any car is worth that much.

Not shown here (because of the limitations of the camera) is the invisible element of prestige that must influence anyone who buys the Mark II.

Deep-pile carpet adds living-room feel to the car. Nameplate (center) has owner's name engraved on it



ship luggage. However, a larger trunk would spoil the body lines."—Georgia executive.

"Trunk space was inadequate until I installed puncture-seal tires and removed the spare tire as unnecessary."—Florida used-car dealer.

Continental owners do have a luggage problem, especially if four persons are riding in the car. After all, a Mark II would not look right with a luggage rack on the roof or pulling a trailer loaded with luggage!

Next on the complaint list is dealer service with 7.8 percent mentioning it.

"Dealer has difficulty getting parts. Car delivered with faulty gas gauge, one window not working. Parts not yet received after two months."—California retired owner.

"A car of that price should include the best service possible. I don't feel the company has impressed the dealers with this notion."—Texas surgeon.

Styling Is Praised

Second on the best-liked list is exterior styling with 38.1 percent mentioning it.

"Styling has elegance without bombast."—Missouri insurance executive.

"Distinguished lines. Conservative yet commanding admiration."—Wisconsin executive.

"Undated aspect. A car . . . of good basic design that will always be in style."—New Jersey funeral director.

Ease of handling, despite the bigness of the Mark II, is third on the list of best-liked

(Continued to page 230)

Big complaint is difficulty of getting in and out due to the low roof, wide door and step-down floor



Spare tire cuts luggage space in trunk drastically



Seat back can hit dashboard, scarring the leather



Owners don't like the big hump in rear floor (above) or the hard-to-get-at ash tray in front door (below)





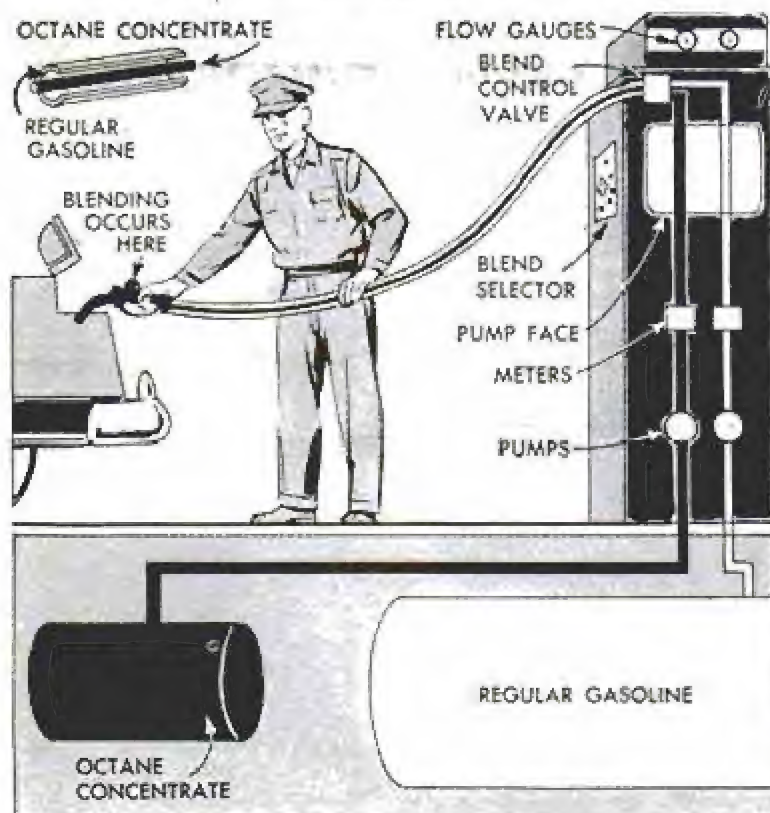
Sculling Blade Moves Boat Silently to Avoid Disturbing Fish

One of the oldest methods of boat propulsion—sculling—has been brought up-to-date. A new blade which fastens to the transom or gunwale takes the art out of sculling. The fisherman or duck hunter merely moves the handle back and forth, and the variable-pitch blade, operated by springs, wiggles like a fish's tail to move

the boat. The sculling blade permits silent movement through the water, enabling the fisherman to move through his favorite spots without disturbing the fish. He can operate the blade with one hand while he casts with the other. The blade folds out of the water when not in use, and can be clamped beside an outboard motor.

Mixing Pump Delivers Any of Five Different Gasolines

By setting the control valve, the attendant selects any of five octane ratings to match the car's requirements. Highest rating is in excess of 100 octane. Mixer pump is being tested in Florida by the Sun Oil Company





All cars are carried under cover on three decks. A VW is pushed onto the elevator from bottom deck here



Operator raises elevator until it's level with door in side of ship (below) through which the VW is then rolled onto dock. No gas is in cars during voyage

Volkswagen Car Ferry

WHEN VOLKSWAGEN SALES in the United States began to climb (1956 estimate: 60,000), transportation became the problem. With typical thoroughness, the VW engineers designed a fleet of ships just to haul the little "bugs." Today the fleet plies between Germany and the United States with ferrylike regularity. Two sizes of ships are used: A large size (capacity 900 VWs) for ocean ports like New York and small size (290 VWs) for the inland ports like Chicago.



Unloading at Chicago. Ship has Italian name (*Rigoletto*), Swedish captain, and hauls German cars to America!





There's Atomic Energy in Granite: Can We Unlock It?

By Dr. Harrison Brown
Professor of Geochemistry,
California Institute of Technology

As Told to
Thomas E. Stimson, Jr.

Prospector searching for radioactive ore with a scintillometer gets a high count when testing granite, indicating presence of uranium

COMMON, ORDINARY igneous rock contains all the energy that civilization can use. The energy in a single ton of granite is equal to 50 tons of coal.

The same rock holds immense quantities of valuable metals.

Consider this: 100 tons of granite, a chunk somewhat larger than an automobile, contains eight tons of aluminum and five tons of iron.

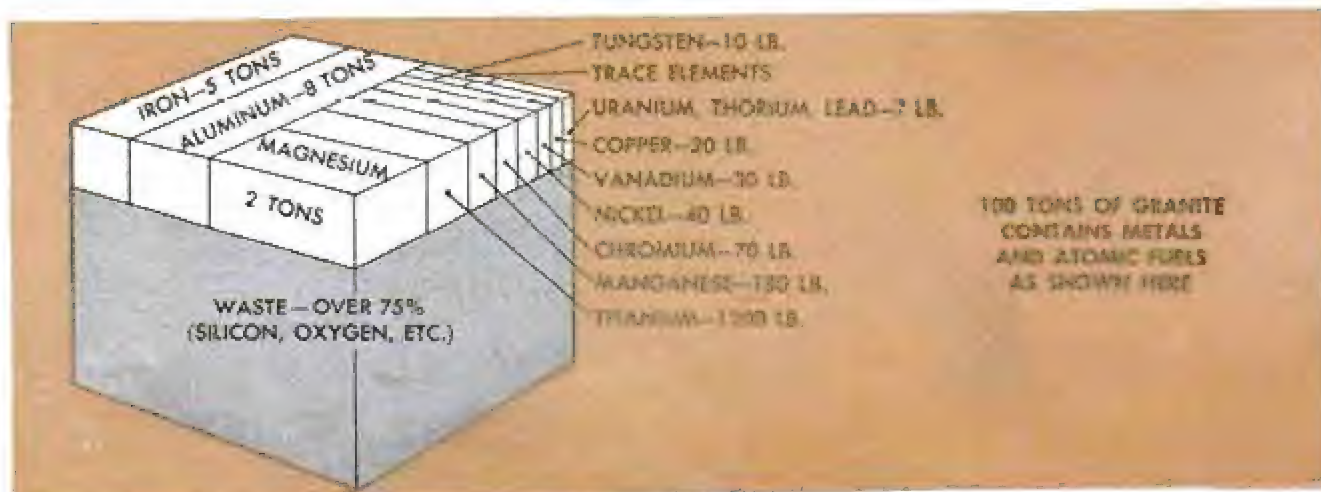
Other ingredients include two tons of magnesium, 180 pounds of manganese, 70 pounds of chromium, 40 pounds of nickel,

30 pounds of vanadium, 20 pounds of copper, 10 pounds of tungsten and four pounds of lead.

In 100 tons of average granite there are 14 ounces of uranium and about two pounds of thorium. These radioactive elements are equal in energy to the power obtained from 5000 tons of coal.

Is it possible to unlock this energy from the rock?

It is surprisingly easy. The two elements are concentrated in accessory minerals that make up less than one percent of the





New portable coring tool replaces heavier, more expensive equipment, samples rock to depth of 50 feet

weight of the granite. The rock merely needs to be crushed to grain size and leached for a short time in dilute hydrochloric acid. The acid dissolves and retains important percentages of the uranium and thorium. These may then be separated from the acid by a series of straightforward chemical steps.

This simple process extracts only 25 percent of the radioactive materials but even on this basis, 100 tons of granite yields nuclear fuels that can produce the same energy as is obtained from burning more than 1000 tons of coal.

From the standpoint of energetics it "costs" less than three tons of coal to mine 100 tons of granite and extract its radioactive ingredients. This cost includes the power devoted to quarrying the rock, crushing it, disposal of wastes, transportation, acids, water pumping, shop facilities and other considerations. Thus, by burning three tons of coal one gets a profit, in energy, amounting to 997 or more tons of coal.

In dollars and cents the picture is not as bright. The price of producing uranium from average

granite is estimated at around \$340 per pound. Uranium can be extracted from richer ores much more cheaply than this.

However, some large bodies of igneous rock contain higher-than-average amounts of uranium and thorium. The price of uranium doesn't need to climb much above present levels before these bodies can be mined at a profit.

More study needs to be given to recovery methods that would extract possibly 80 percent of the radioactive materials in

Chemical apparatus in the laboratory of the California Institute of Technology is used to separate some metals from granite

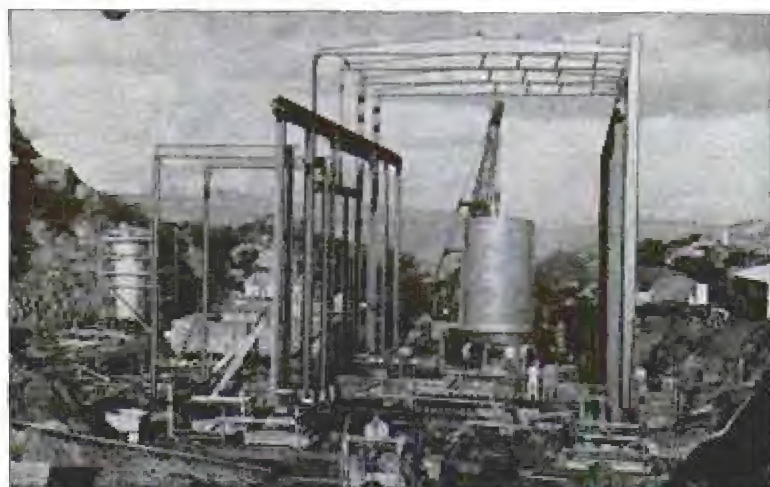




Glauber salt is precipitated out of brine by a spraying process at Searles Dry Lake, Calif. Methods similar to this may eventually be used to extract many products from ordinary igneous rocks such as granite



Above, mineral cores taken from crystal body under Searles Dry Lake, consisting of numerous chemicals locked together. Below, container housing core of sodium-graphite reactor in Santa Susana Mountains, near Los Angeles, is lowered into place



granite. Too, it may pay to investigate the recovery of uranium and thorium as by-products in ordinary hard-rock mining and milling operations. Some mine dumps, also, might pay a profit if their pulverized materials were reworked for their radioactive contents.

In any event, there is ample uranium and thorium in the igneous rocks of the earth's crust to power a highly industrialized civilization for an extremely long time, certainly for thousands of centuries. No nation need be a have-not in atomic energy, for the raw materials are available everywhere.

The role of thorium as a source of atomic energy is relatively new and is still experimental. Thorium is three times as abundant as uranium. In its refined state it is a gray metal resembling platinum in hardness and ductility. It can be extracted from more than 100 different minerals. One source of thorium is the colored glassy monazite particles in granite.

The radioactivity of granite, as a matter of fact, has led to much confusion on the part of week-end prospectors. Prowling the hills with a geiger counter, an amateur prospector is apt to be elated when

(Continued to page 252)



*Coming Next
Month*

**OUR BIG ANNUAL
SPECIAL SECTION
ON
HOMES**

Featuring:

An exciting new *PM* home for families with three to five children—a house with a unique children's area that we predict will be the home sensation of the year. It was planned by a noted designer especially for *PM* readers.

Also

- Pointers From the King of Remodelers
- An Album of New Homes
- How to Get More House for the Money
- Space Savers—Storage Walls
- Home Soundproofing
- Shutters Are Back Again
- Your House of the Near Future
- Miracle With Hardwood Panels
- Save \$ \$ \$ By Finishing It Yourself
- Paving That Patio
- New Materials and Ideas

Look for the 50-Page home section in October



Catching rig is pushed ahead of boat. It is equipped with skids that ride along the bottom of the lagoon

Shrimp Ranch Harvests Bait

AN ESTIMATED 13,000,000 head of marketable shrimp roam the watery range of what may be the world's only shrimp ranch. Located in a lagoon of Bird Key, just off Maximo Point near St. Petersburg, Fla., the ranch confounds experts who said shrimp couldn't be raised in captivity.

A concrete retaining wall several city blocks long keeps shrimp in the lagoon and assures a minimum water depth of 18 inches. The wall above the 18-inch level is inset with 98 gates of nylon screening that permit tidal flow but keep fish out.

Live shrimp, potent fish bait, sell to anglers for \$15 per thousand. A single

female produces 500,000 eggs at each spawning. These facts helped line up backers of the Bird Key Shrimp Company.

Chief problem has been to harvest the shrimp without destroying their breeding grounds. Now, a weird rig of nylon netting promises to lick the difficulty. Pushed by a small, powered boat, the scoop sweeps the lagoon in a set pattern in the dark of night. A searchlight "freezes" the shrimp long enough for them to be caught. Equipped with skids like a sled, the featherweight harvester minimizes damage to the shallow lagoon bottom while floating along at the proper height.

Caught shrimp are dipped from storage pen. Seven-foot nylon gates allow water to pass through concrete dam



KEEPING UP WITH THE ATOM

ONE OF THE MOST important scientific papers of recent years is the report of the National Academy of Sciences on the long-term effects of radiation. The report is not so much concerned with the danger of a large dose of radiation to an individual as with the gradual effects on the human race over a period of centuries.

The dangers, of course, are genetic. Natural radioactivity has always had an effect on evolution. Cosmic rays and other natural radiations can alter an individual's genes, so that his children are departures from his own type. Such altered or mutated genes are inevitably passed along from generation to generation. It's a one-way street, as the altered gene never reverts back to its original type. In this way mutations gradually affect the course of evolution.

The scientists who wrote the report are concerned about the tremendous boost in radiation that may occur as more and more reactors are built. Such a boost could cause a big increase in the number of mutated genes. The scientists are not predicting a race of freaks or monsters. What they see is the possibility of a slow deterioration of the human race over many centuries. Poorer resistance to disease, higher death rates, lower birth rates and an increase in hereditary factors that are detrimental—these may be hallmarks of the atomic age. From a purely selfish standpoint, you don't have to worry about such things. But they may be big worries to your descendants.

The scientists recommend that medical X rays be held to an absolute minimum. This is particularly important up to age 40, as nine tenths of the babies of this country are born to parents younger than 40. They also suggest that a system be set up for keeping track of each individual's radiation exposure, to make sure X rays and the background radiation do not add up to overexposure which might alter his genes.

☆☆☆

Trees, grass and growing plants extract radioactive particles from the air, according to scientists of the Naval Research Laboratory. Whether this natural filtering action is helpful or harmful to man is not yet known.

Experiments show that the radioactive particles strike the small fibers of plants and stick there.

The process puts scientists face to face with a paradox. It is believed that any elim-

ination of radioactivity from the atmosphere, no matter how slight, is beneficial to man. On the other hand, edible plants may snatch radioactivity out of the air, absorb it and carry it over to the dinner table.

☆☆☆

The Los Alamos Scientific Laboratory recently announced a discovery of major importance. Scientists there have detected the neutrino, an atomic particle predicted more than 20 years ago but never identified until now.

Neutrinos are so penetrating that they will pass through billions of miles of solid matter. Scientists hope the discovery of the neutrino will aid in an understanding of the "glue" which holds nuclei together.

☆☆☆

In 1955 the United States had 29 research and power reactors, compared to 16 for the rest of the world. By 1960 this country should have 91 reactors compared to 81 for the rest of the world.

☆☆☆

The man below is holding in his hands the equivalent of 400 tons of coal. The object is a \$4000 fuel element containing 145 grams of U-235. It will be placed in the Ford Nuclear Reactor at the University of Michigan this fall. The reactor will be used for research on the peaceful uses of atomic energy.





Miniature Lathe Teaches Woodworking

Designed as a toy, a miniature lathe for children will actually do a lot of the turning jobs that the big lathes in the shop will do. It is safe for children because its shaft can be stopped by the fingers, but in spite of this safety feature it has enough power to turn out items from wood, plastic and even aluminum. The over-all length is 27 inches and the weight is only 16 pounds, making the machine easy to move from place to place. Power is provided by a $\frac{1}{35}$ -horsepower motor, and there are no belts or gears to damage fingers of young operators.

"Crow's Nest" Gives Television Cameramen Bird's-Eye View

British TV cameramen get a bird's-eye view of sports events from a "crow's nest" on the top of a tall hinged column. Mounted on a truck, the column lowers to the ground to pick up or unload the camera operator. The equipment, used first at a race track, enabled the cameras to sweep the whole course. It is operated by a London firm that covers events for the new commercial television system.

Platform raises TV camera and operator for unobstructed view



World's Waterpower Barely Tapped

While atomic energy may supply most of the horsepower of the future, energy from falling water will continue to be a major and growing power source in years to come. At present, according to a United States Geological Survey, energy developed from waterpower throughout the world has reached a total of 130 million horsepower. But this is only a fraction of the possible three billion horsepower the survey says could be developed from all of the world's rivers and streams.

¶There is a total of 47 different antivenom preparations available for treatment of snake bite, scorpion sting and spider bite.



Cloth Reflects Car Lights For Pedestrian Safety

Clothing which gives a brilliant reflection of light at night is designed to increase pedestrian safety. Yarn woven into the garments is coated with microscopically small glass lenses. The yarn looks and feels like untreated yarn in daylight. At night it reflects light back only to the source of the light, so the garment looks like any other except to the motorist, who is sitting behind one of the headlights.

Powered Lawn Roller

Metal cans filled with concrete form the wheels of a motorized lawn roller built by Thomas Pitts of Knox, Ind. The motor came from a garden tiller. The front axle is an iron pipe embedded at each end in the concrete of the rollers.

Battery Aids Leg Growth

Miniature electric batteries are being built into children's legs to stimulate bone growth when the legs are of unequal length. So far the technique has been used on 18 cases at Children's Memorial Hospital, Chicago, with encouraging results. Typical case was that of one child whose shortened right leg grew about $\frac{3}{4}$ inch in nine months after a battery was installed. Technique will work only during growing years.

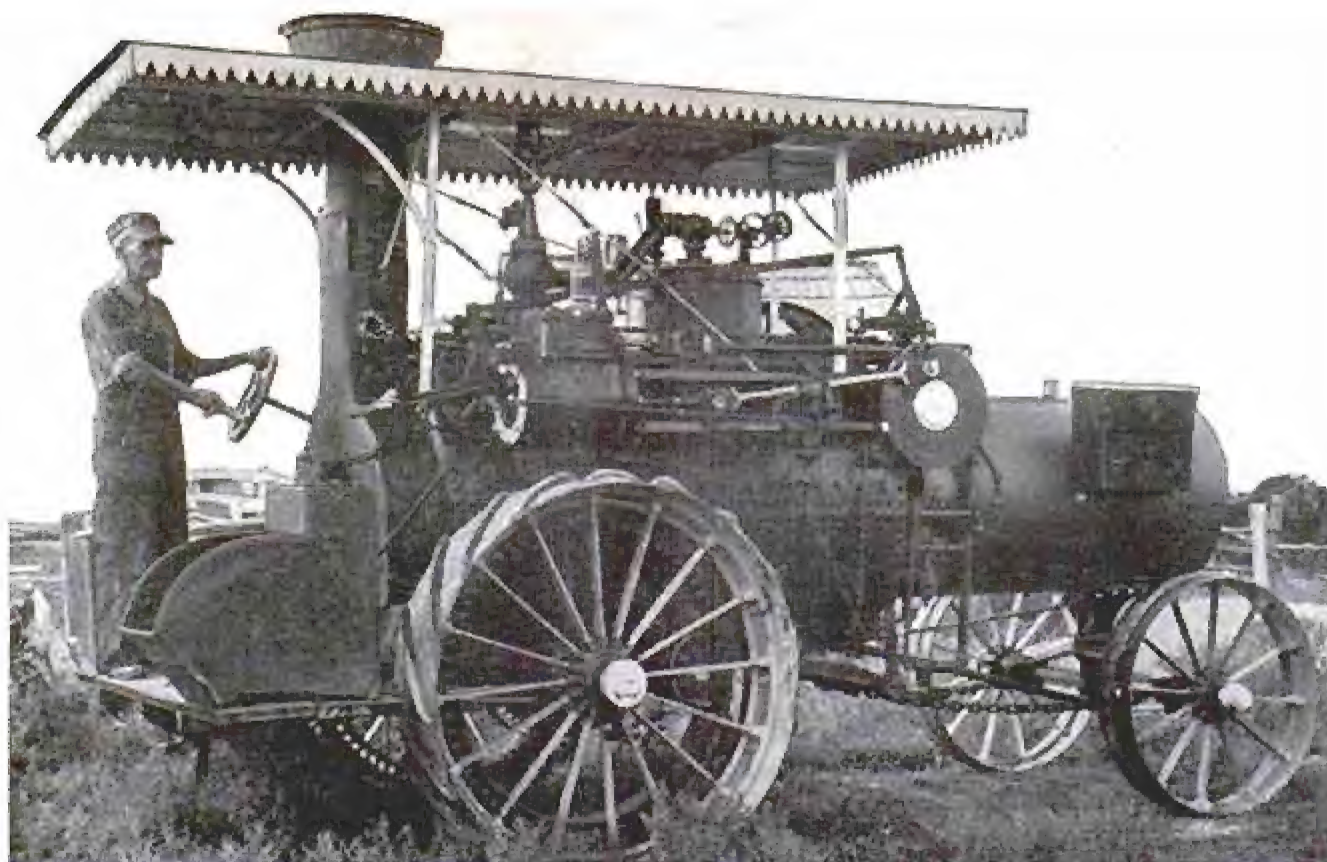


Pulley mounted on electric water pump permits it to be operated by gasoline engine during emergencies

Gasoline-Driven Lawn Mower Powers Emergency Pump

When storms or floods cause a power failure, farmers and other homeowners who depend on electricity to operate their water pumps can now switch to a gasoline-driven lawn mower as a power supply. One manufacturer of water systems has installed an emergency pulley on his equipment which permits any small gasoline engine to supply power to the pump by means of a belt attachment.





Built around 1890, the Kitten delivered 25 horsepower under the belt of the flywheel and 16 at the drawbar

"Thrashin' Machine" Revival

By Louis Martin Reitz

WHEN ROY ALEXANDER of Bourbon, Mo., was a small boy in the early 1900s he saw his first traction engine and with one whiff of steam and hot oil he got the fever and has never quite recovered. Unfortunately the nearest he ever got to one was when he hauled wood to fire up.

That is, until a few years ago when he found one standing in an old machine shed

where the hens were using it for a roost. Alexander bought it and set to work with a will and a scraper. He soon discovered that the layers of hardened-oil and grease had formed a good protective coating over the machinery and, as these engines burned mostly wood, boiler and flues were good.

After working it over with a bucket of coal oil and a stiff brush and replacing a few flues, he went over the entire engine taking up or pouring new bearings; replacing fittings and tightening up in general. Then with several cans of bright enamel he restored the paint job which in the old days was quite gaudy.

The boiler was usually black with gold trim; the running gear and wheels red or yellow and the steam engine would be red or maroon with gold.



Door was provided for cleaning soot from flues. Keck-Gonnerman engine gave 50/18 horsepower

trim. The water tanks and fuel boxes might be green with yellow or gold curlicues.

This first engine was called a Jumbo and was a sight to see that morning in the sunlight with its new canopy of modern aluminum. Roy put in a fire and watched the needle go over. He then pushed the cutoff lever over to full stroke and, with a few toots of the chime whistle, "Old Jumbo" lumbered off across the fields.

Since then, Alexander has acquired several more engines and restored them. The Kitten engine is his favorite and its design follows closely that of the early Western river steamboat engines and boilers. The stack is to the rear and the engine is also mounted "rear end to." The flames pass from the firebox under the boiler and then return through the flues and up the stack. The cylinders are to the rear and the flywheel and cranks are in front just as they were on the old river boats.

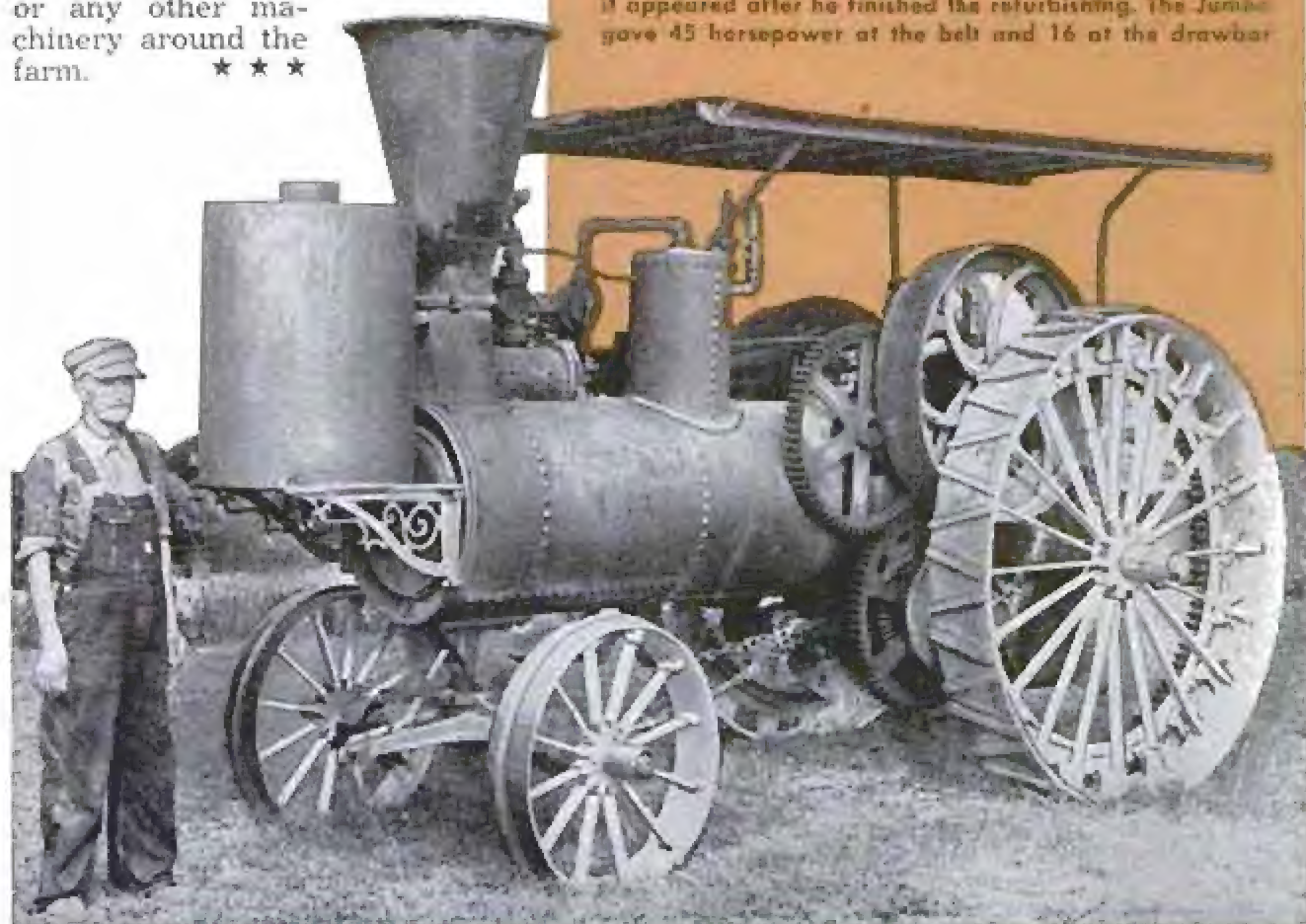
The engines were geared way down and had loads of power at the drawbar at a speed of about four miles per hour. There was a clutch in the flywheel and the belt ran directly off the flywheel and powered the separator or sawmill or any other machinery around the farm. ★ ★ ★

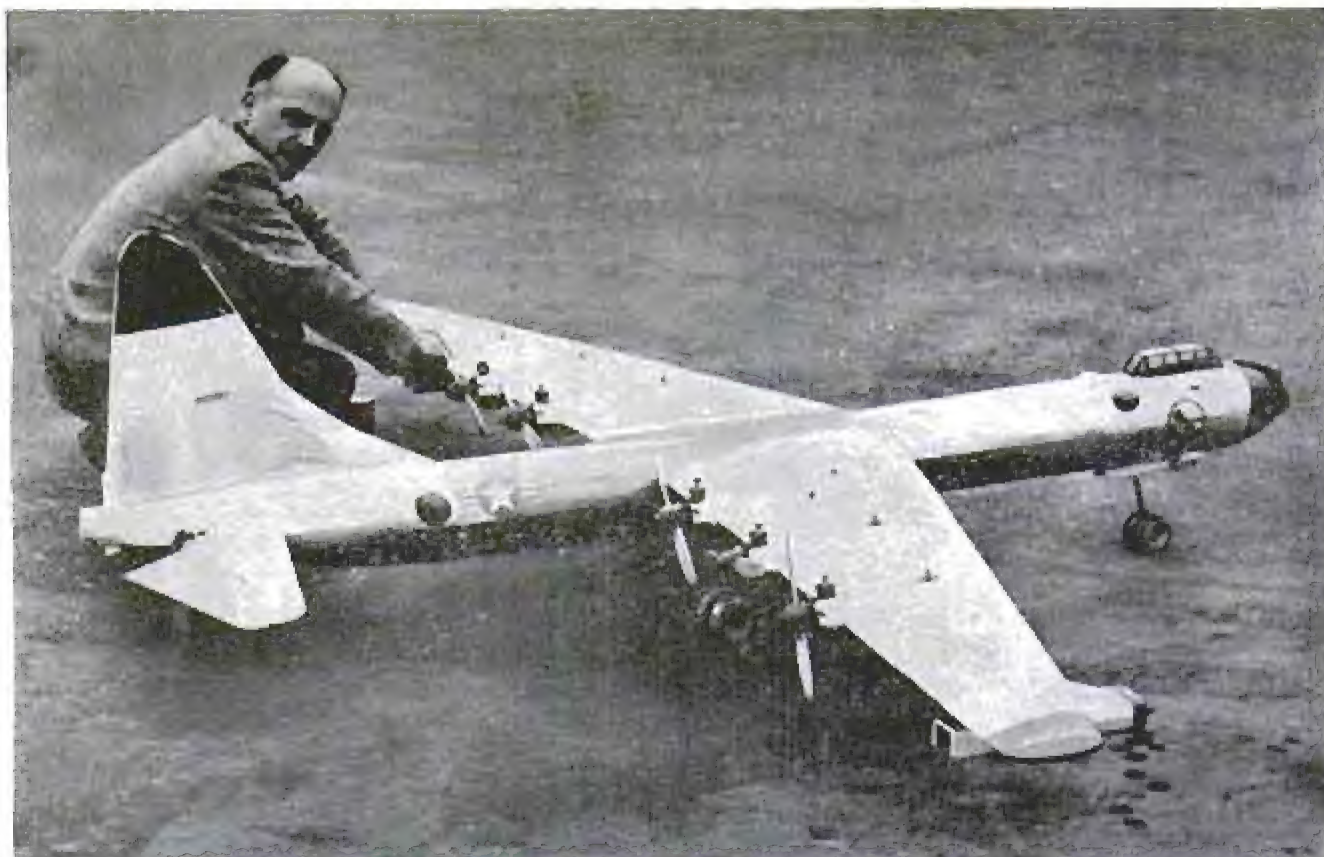


The Case, above, was bigger than most engines, having 65/25 horsepower. Below, Keck-Gonnerman gets an application of oil



Below, the Jumbo, Alexander's first traction engine, as it appeared after he finished the refurbishing. The Jumbo gave 45 horsepower at the belt and 16 at the drawbar

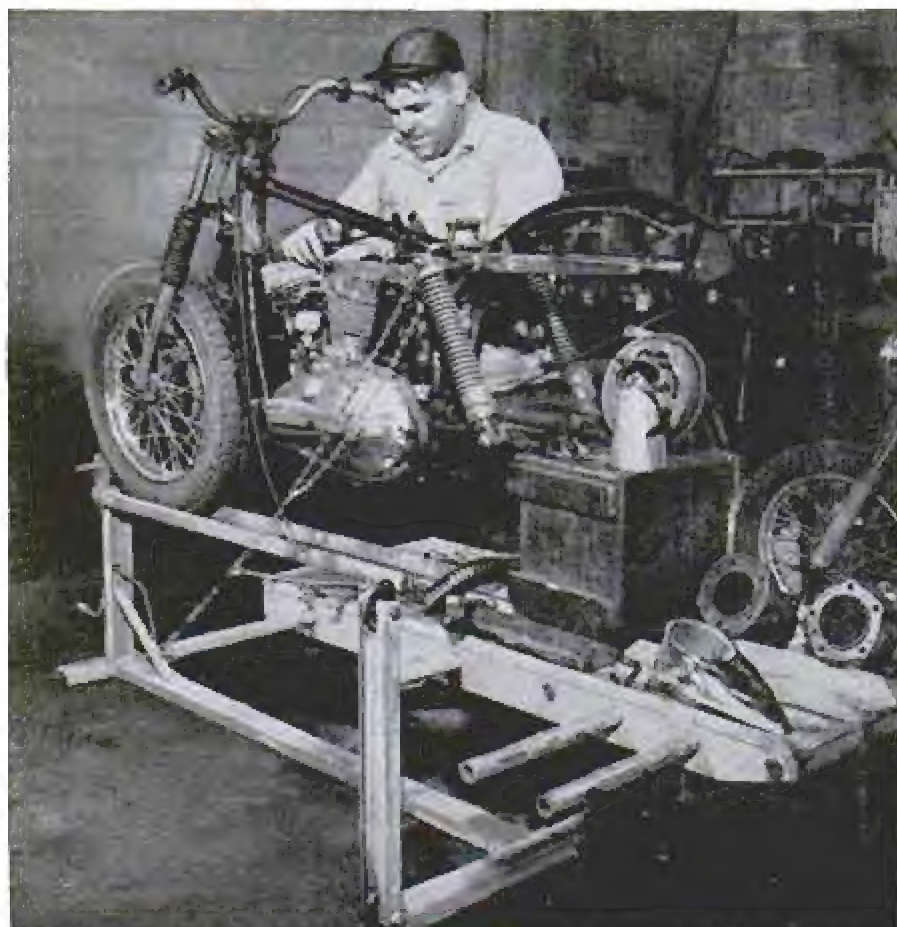




Six Tiny Diesels Power Model B-36

After 200 hours of painstaking labor, Helmut Appelt, of Stuttgart, Germany, has completed and flown a scale model of the global B-36 bomber. The model has a wingspan of 9 feet, 9 inches and weighs 16

pounds. Power is supplied by six tiny diesel engines, plus two rockets which give the plane an extra push on take-off. The plane will fly for six minutes at 30 miles per hour while attached to a 75-foot cable.



Motorcycle Hoist Eases Repair Job

Motorcycles mounted on a portable hoist are held at a convenient working level for the mechanic, who can sit or stand. One end of the hoist is raised and lowered by a hand crank. A hand winch mounted at the stationary end pulls the vehicle up into position for raising. The back half of the work platform is wide enough to hold tools and parts, and contains holes for pipes which hold the rear wheels of three-wheeled cycles and garden tractors. The motorcycle wheels rest in a grooved center rail. Easily moved by two men, the repair jig can be carried in a small truck or trailer and taken to races or hill climbs.

Pick up Short Waves on Your Radio With This

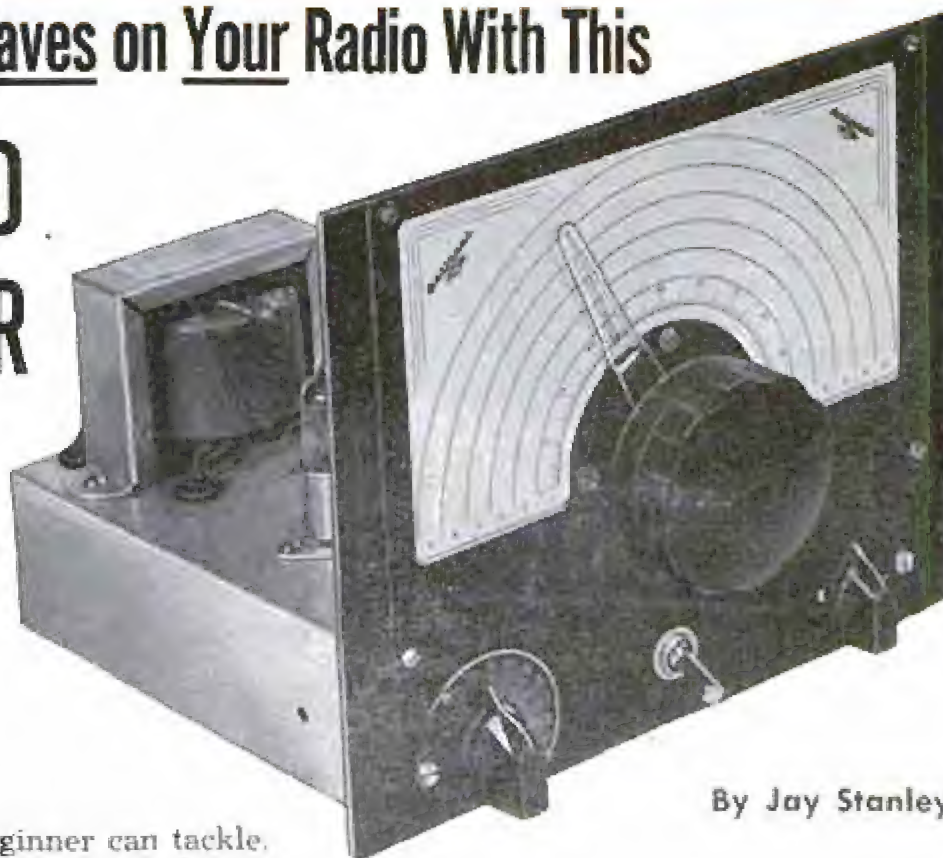
MULTIBAND CONVERTER

BUILDING A band-switching communications receiver is a project only for a real expert, armed with a lot of expensive test equipment and a considerable amount of know-how. However, a simple converter — with plug-in coils — is a job which even a careful beginner can tackle. And a good converter, used ahead of even a passable a.c.-d.c. radio, will give a \$100 receiver a run for its money.

The converter described here uses the latest in "low noise" circuitry. It is simple to build and will do an excellent job of pulling in short-wave stations from all over the world. Thanks to a simplified tuning arrangement, there are no alignment problems, and the unit can be put into operation with no test equipment at all.

How It Works

The converter uses a pair of 6J6 tubes, and a 6BD6, in a unique circuit popularized by a New Zealand radio amateur, ZL4GP (see schematic diagram in Fig. 2). One of these 6J6 tubes is used as a two-stage oscillator, while the other serves as an r.f. amplifier and mixer. The signal from the antenna is applied to one of the grids of the mixer, while the oscillator signal is fed to the other grid through capacitor C6. The two plates of the mixer are tied together so that the intermediate frequency (the difference between the oscillator and incoming-signal frequencies) appears in the output. This intermediate frequency (i.f.) is then amplified in the following stage and applied to the output jack.



By Jay Stanley

A built-in power supply furnishes the various voltages required by the tubes. To eliminate the possibility of a "hot" chassis, a power transformer is employed. This isolates the circuitry from the a.c. line, and provides filament voltages for the tubes.

The i.f. of the converter falls in the upper portion of the standard broadcast band (between 1400 and 1600 kc.). As a result, any signals picked up by the converter are reduced to a specific frequency within this range and actually rebroadcast to an ordinary radio. In doing this, all of the amplification of the radio, as well as that of the converter, is being used to increase the strength of the short-wave signals. An ordinary 5-tube receiver thus becomes an 8-tube unit for short-wave reception.

Construction

In building the set, the first step is to lay out the chassis. A rear view of the converter, showing the location of all chassis-mounted parts, is illustrated in Fig. 1. The exact location of these is not critical, but your layout should closely follow that of the model, so that the corresponding pictorial diagram, Fig. 3, can be used for the actual wiring. Three holes must be drilled

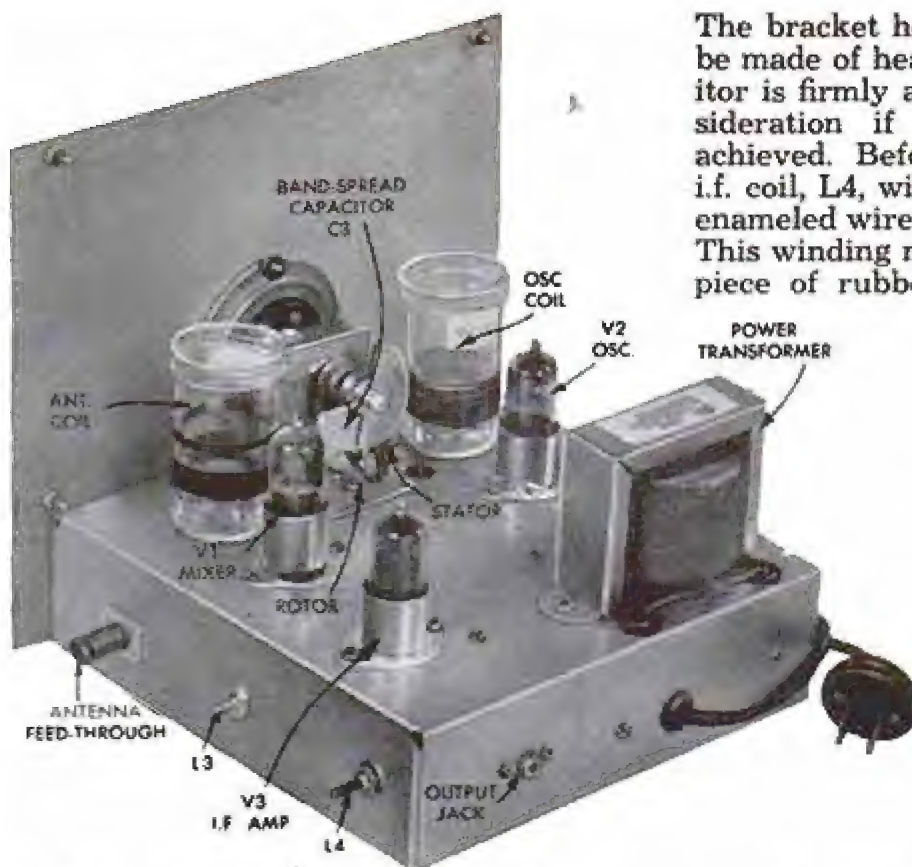


Fig. 1. Rear view of converter shows parts location on 7 x 7 x 2-in. chassis

in the front lip of the chassis to accommodate the band-set capacitor, the on-off switch and the mixer-peaking capacitor. The chassis can then be used as a template for drilling the corresponding holes in the front panel. The holes in the center of the panel, for mounting the bandspread capacitor, C3, may be drilled later, after the capacitor has been mounted on the chassis.

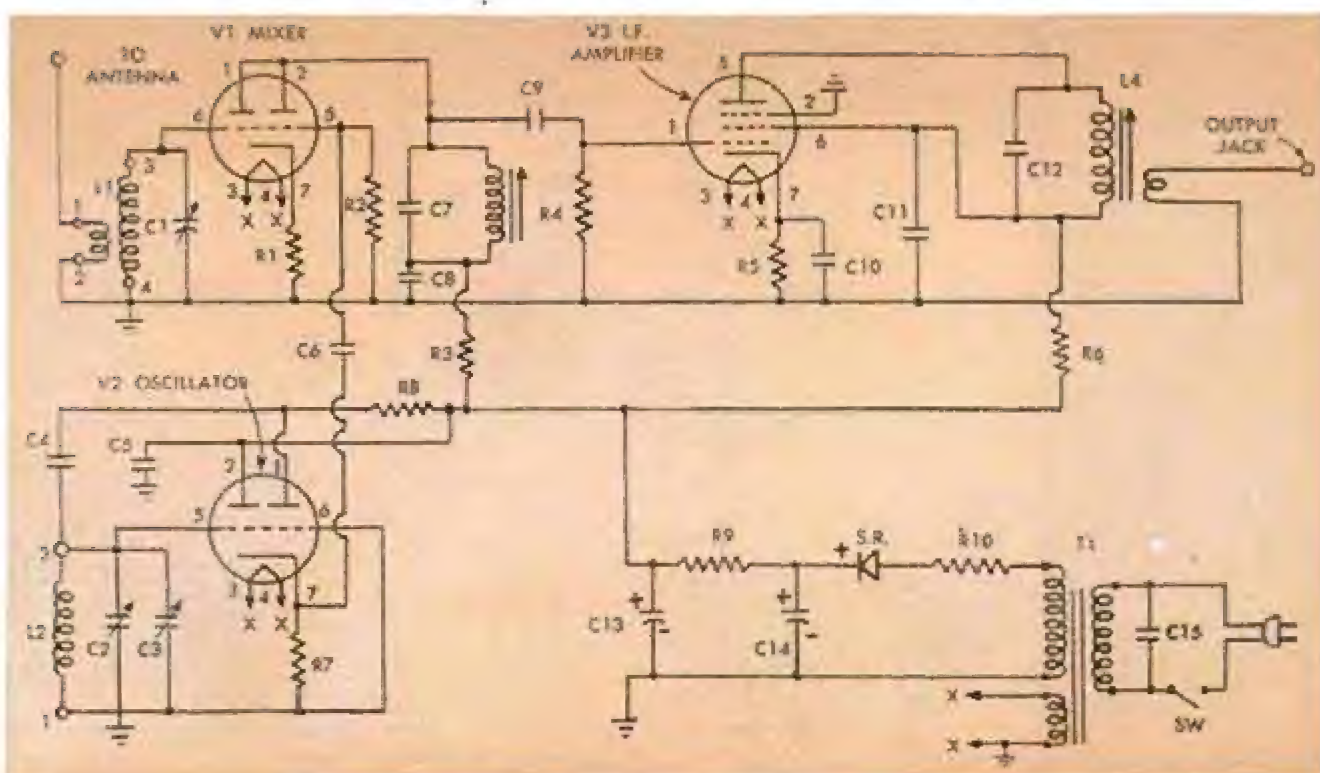
The bracket holding this capacitor should be made of heavy metal so that the capacitor is firmly anchored, an important consideration if smooth tuning is to be achieved. Before mounting the output i.f. coil, L4, wind about 25 turns of No. 30 enameled wire around the end of the form. This winding may be secured with a small piece of rubber tape so that it will not unravel as the coil is mounted.

Be sure to observe polarity when mounting the selenium rectifier between the two terminal strips. Failure to do this will result in damage to the rectifier, the filter capacitors, or both, when the set is turned on.

Wiring of the set is straightforward with the usual precautions of short, well-soldered leads and careful checking and rechecking to avoid wiring errors.

Care should be taken in winding the various plug-in coils to make sure that the correct number of turns is used to cover the individual bands. All antenna coils have two windings while the oscillator coils have only one. The six coils for the lower-frequency bands are wound on 1¼-in.-dia. coil forms. For the highest band, commercially available Miniductor coil windings are used. These are wired to standard four-

Fig. 2. Schematic diagram of multiband short-wave converter. Two plug-in coils are used for each band



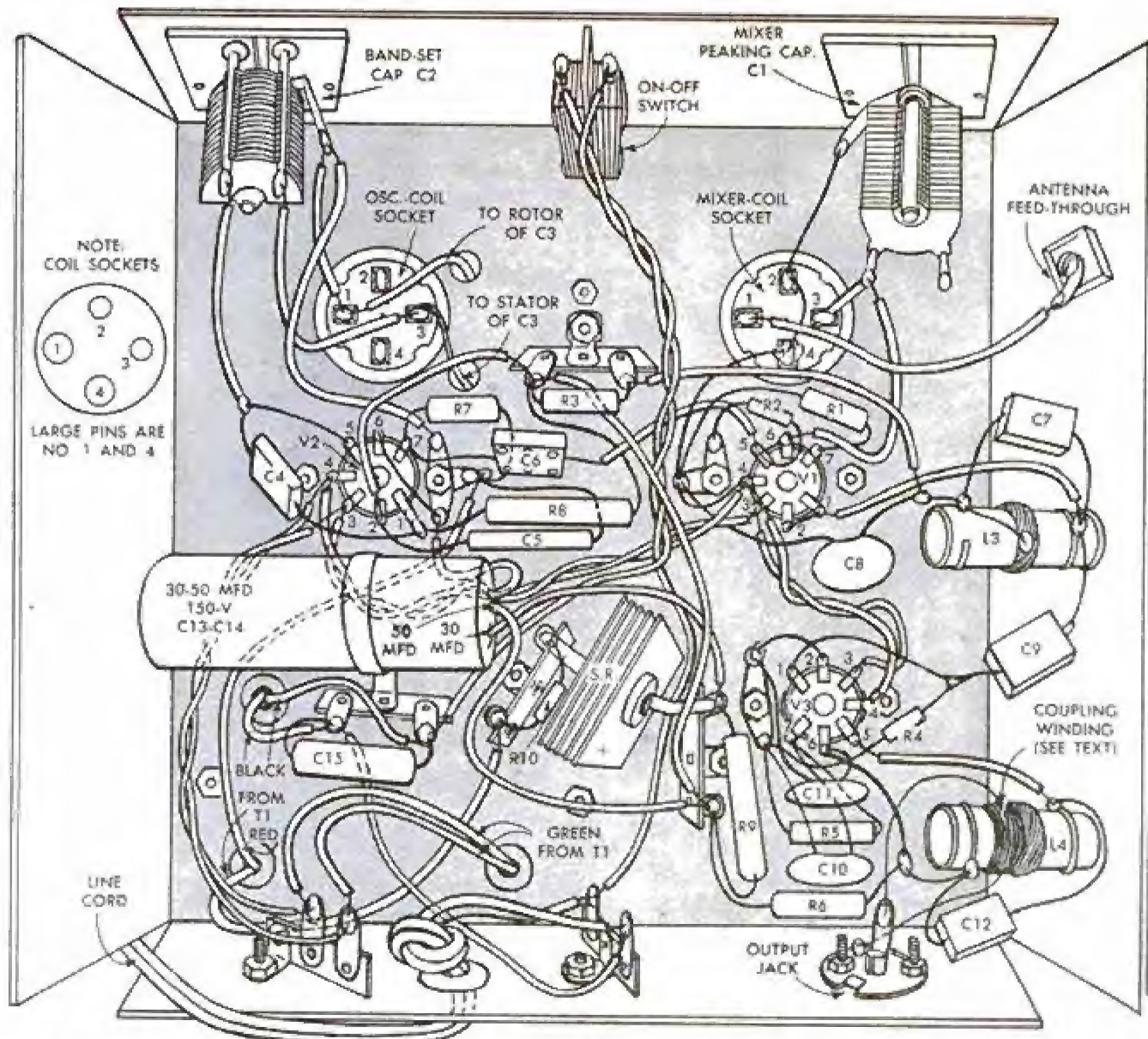


Fig. 3. Bottom view, pictorial wiring diagram. Keep all connecting wires and leads as short as possible

LIST OF MATERIALS

RESISTORS

(K=1000 ohms. M=1,000,000 ohms)

R1=3K, $\frac{1}{2}$ w. R6=1.5K, 1 w.
R2=27K, $\frac{1}{2}$ w. R8=20K, 1 w.
R3=4.7K, $\frac{1}{2}$ w. R9=1K, 1 w.
R4=1M, $\frac{1}{2}$ w. R10=27 ohms, 1 w.
R5, R7=470 ohms, 1 w.

CAPACITORS

C1, C2=100 mmfd. variable, Hammarlund type HF-100
C3=15 mmfd. variable, Bud type 1850
C4, C7, C12=10 mmfd. silver mica
C5=.003 mfd. ceramic
C6=100 mmfd. mica
C8, C10, C11=.01 mfd. ceramic
C9=50 mmfd. mica
C15=.005 mfd. 600 v. tubular
C13, C14=30-50 mfd./150 v. electrolytic

MISCELLANEOUS

L1, L2=Hand-wound coils (see coil table)
L3, L4=1 mc. slug-tuned coils. CTC type LS-3
(L4 is modified as per text)

T1=Power transformer, sec. 120 v.-50 ma. and 6.3 v.-2a. Merit type P-3045 or equivalent
SW=8-p.s.t. toggle switch
S.R.=Selenium rectifier, 65 ma.
V1, V2=6J6 tubes
V3=6DB6 tube

Quant. Description

2 4-prong sockets (for coils), ceramic
6 4-prong coil forms, $1\frac{1}{4}$ " dia., $2\frac{1}{4}$ " high, ICA type 1108B
1 B & W Miniductor, type 3014
2 4-prong plugs (see text)
3 7-prong miniature sockets (use ceramic sockets for oscillator and mixer tubes)
1 Vernier dial, National type ACN
1 Dial plate, 180° graduations, for band-set capacitor
1 Chassis, 7" x 7" x 2"
1 Panel, 7" x 8 $\frac{1}{4}$ "
1 Through-panel insulator
2 Pointer knobs

Line cord with plug, rubber grommets for $\frac{3}{8}$ " hole (4), pin jack, 2-point terminal strips (6), 1 pkg. 6-32 x $\frac{1}{4}$ " machine screws, hex nuts, solder lugs, hookup wire, rosin-core solder.

prong plugs or to coil-form bases from which the tops have been cut off. Fig. 4 shows the two types of coils, together with coil-winding information for the bands.

Special care should be used in drilling the panel holes for mounting the dial. Remember that the shaft coupler of the dial must line up perfectly with the capacitor shaft, and act accordingly.

To avoid hand-capacity effect, with its associated tuning difficulties, the panel must be securely fastened to the chassis. Any paint on the back of the panel, where the panel will contact the chassis, should be scraped away, and the two units should be fastened together with machine screws and nuts at the chassis ends.

(Continued to page 258)

Recording-Level Meter

By Dr. Richard C. Hitchcock

IN LAST MONTH'S ISSUE, we described the construction of a multichannel mixer-preamplifier for increasing the versatility of a recorder or converting an ordinary amplifier into a PA system. Here, then, is a recording-level meter designed as a perfect companion for the mixer.

Most present-day recorders incorporate some sort of recording-level indicator. Usually, this takes the form of a simple neon bulb which lights up on the peaks of the input signal, to indicate that the recorder is being overdriven. Only the most expensive professional recorders actually include a meter which gives a continual indication of the signal strength. Yet, for quality recordings, such a meter is almost indispensable. Not only does it show the point of overloading, but it also indicates when the signal is too weak for proper recording. Observation of the meter, therefore, permits you to turn down the level control for loud passages before the overload point is reached, and to turn it up during the soft passages, so that these, too, will be audible in the final reproduction.

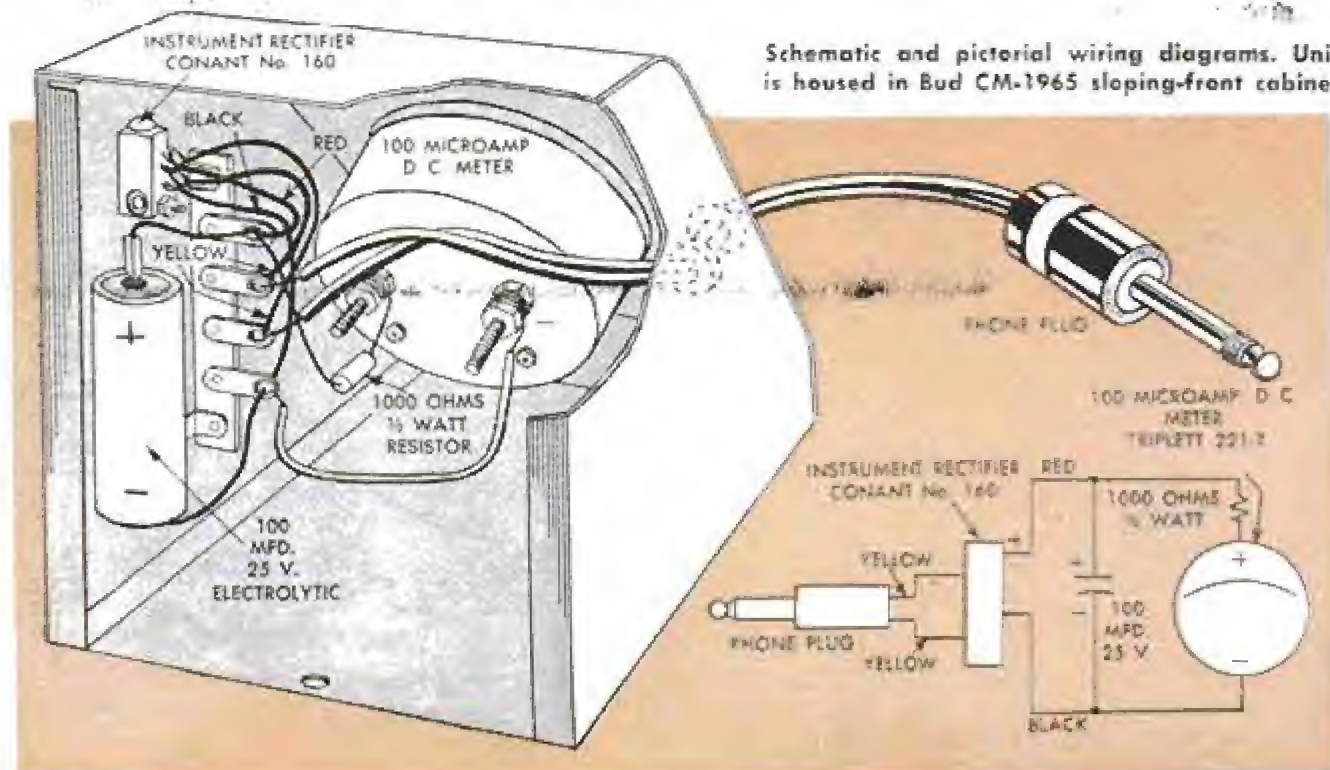
In use, the meter is plugged into the monitor jack of the mixer. At this point, the output voltage is high enough to drive the meter pointer off scale when the signal at the mixer output jack has reached a level which will overdrive the recorder. The audio signal is then rectified by an instrument-type rectifier and applied to a



sensitive d.c. meter through a 1000-ohm limiting resistor. A 100-mfd. capacitor in parallel with the meter and limiting resistor slows down the action of the meter so that it will tend to indicate the average level, rather than the instantaneous peaks, of the recorded program. By careful monitoring of the meter, both extremes, the dangerously loud and the abnormally soft passages can be adjusted to the proper recording level.

The simplicity of the circuit is shown in the pictorial and schematic diagrams. The entire unit is built into a sloping-panel steel cabinet which matches that of the mixer. The rectifier is mounted on the side of the cabinet and its leads are soldered to a terminal strip. These leads should not be

(Continued to page 262)



Schematic and pictorial wiring diagrams. Unit is housed in Bud CM-1965 sloping-front cabinet

the

POPULAR
MECHANICS

CRAFTSMAN

WTM 58



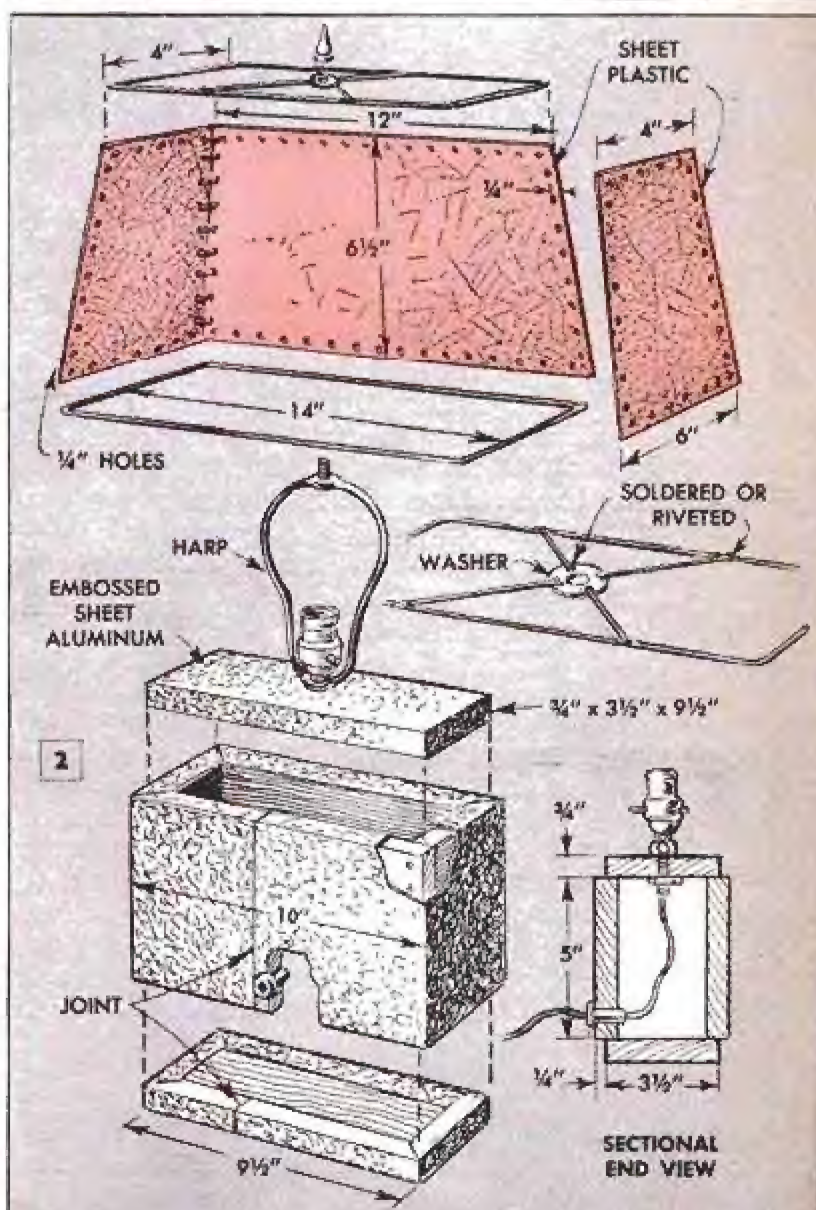
MATCHING LAMP and FOLDING SCREEN

By Bertram Brownold

NOW AVAILABLE in many craft and hobby shops is thin, rigid plastic sheeting, called Panlam, that is featured in a variety of colors and patterns. Because it is translucent, the plastic is ideal for such items as lamp shades, folding screens and room dividers. Although only a lamp shade and folding screen are described in this article, their construction will suggest many other uses for this versatile plastic material that can be cut with ordinary scissors.

The lamp shade requires two wire frames as detailed in Fig. 2. Joints in the wire can be soldered or the wire may be hammered flat and drilled to permit using small rivets. No vertical members are required in the lamp-shade frame, since the plastic is rigid enough to support itself. Drill holes along the edges of the plastic pieces that are used for the shade to permit lacing them to the frame and to each other. Holes are centered $\frac{1}{4}$ in. from the edges and $\frac{3}{4}$ in. apart.

Embossed sheet aluminum, another modern material, is used to make the lamp for which the shade is designed. The lamp consists of a wooden form, Figs. 2 and 3, over



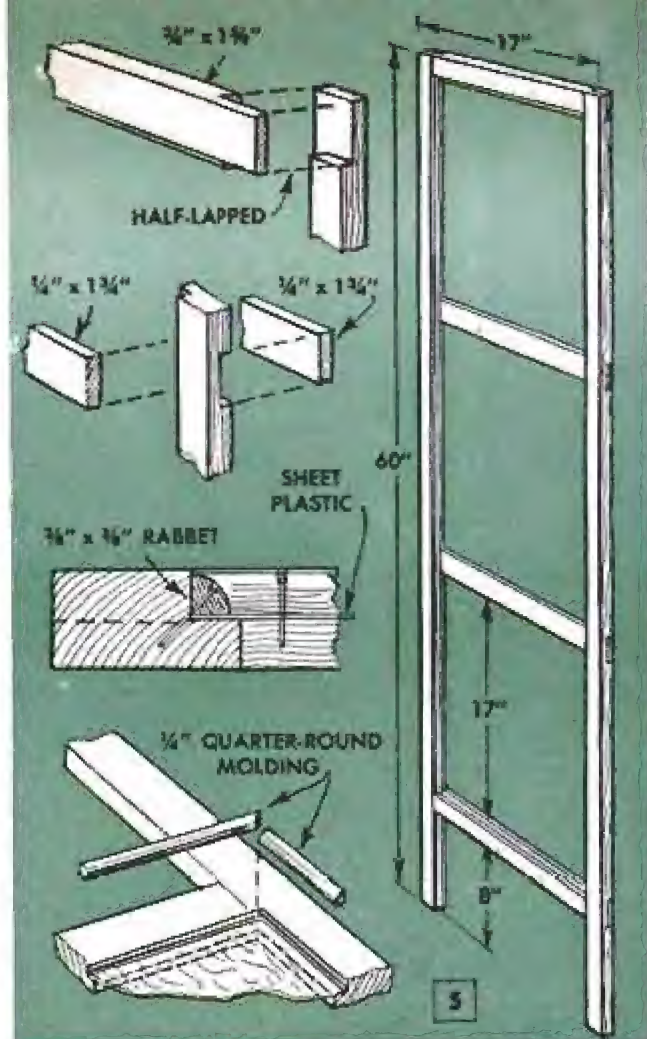


Above, lamp and screen provide interesting ensemble in living room. Below, cutting Panlam with scissors



which the aluminum is folded. A regular lamp harp is used, and is held on the lamp by an assembly consisting of a short $\frac{1}{8}$ -in. pipe nipple screwed into a lamp socket and fitted with a locknut as shown in the sectional end view in Fig. 2. When the sheet aluminum is folded around the wooden lamp form, a seam will result, Fig. 3. Keep the seam at the back of the lamp where it is not readily noticed. To emphasize the embossed pattern of the aluminum, paint it a color to match the plastic shade. Then wipe off the wet paint with a soft cloth so the high spots of the embossing are accentuated. The resulting highlighted pattern is compatible with the design in the plastic.

Frames for the panels of the folding screen are cut from $\frac{3}{4} \times 1\frac{5}{8}$ -in. stock and a $\frac{3}{8} \times \frac{3}{8}$ -in. rabbet is cut along the inner edge of each member to receive the plastic sheet. Joints are half-lapped as shown in Fig. 5. The center cross pieces of the screen frame each require two pieces of $\frac{1}{4} \times 1\frac{3}{4}$ -in. stock. One of the pieces is the full



width of the screen and is set in notches cut in the vertical members. The other piece is shorter by the width of the two vertical members and is nailed over the first piece so the plastic, which is fitted the full length of the frames as shown in Fig. 6, is sandwiched between them. To hold the plastic in the rabbets of the frame, $\frac{1}{4}$ -in. quarter round is nailed over it as indicated in the detail in Fig. 5.

Also shown in Fig. 5 is an alternate method of assembling the screen frames, in which three small sheets of plastic are used instead of one larger piece. The cross pieces are made of the same size stock as the end pieces and rabbeted on both edges. Quarter round then is nailed into the rabbet over the plastic on all four inner edges of each section of the screen panels as indicated in the lower left-hand detail in Fig. 5. Two-way hinges, of the type specially made for folding screens, are used to hinge the screen panels together. Fig. 4 shows the completed ensemble in use in the home. ★ ★ ★

☞ Proper location for a piano is against an inside wall away from extremes in temperature such as excessive heat from radiators, or cold drafts, which affect both tone and finish. Nonoily polish should be used to protect the keys; other types tend to darken the finish.

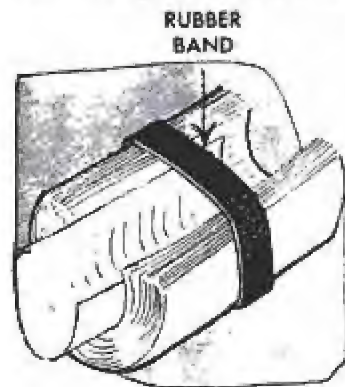
Partitions Separate Contents of Night-Stand Drawer

Installing partitions in the drawer of your bedside night stand will enable you to keep its contents in order and make it easier to locate items when they are needed. Scrap pieces of wood, $\frac{1}{4}$ in. thick, may be used for the partitions, which are fastened together with glue and brads. If you prefer to leave the partition assembly loose in the drawer to facilitate cleaning, wooden braces should be added to prevent it from sliding or twisting out of place. An unused cutlery box provides an even easier method of partitioning the drawer, since it is already divided into sections. The most economical means, however, is to join a number of shallow cardboard boxes together and place them in the drawer for use.

❑ Empty the carpet sweeper or vacuum-cleaner bag on a dampened piece of paper to prevent the dust from flying excessively.



Rubber Band Holds Handbills For Single-Copy Distribution



To hold handbills conveniently and securely for easy distribution one at a time, snap a rubber band around them as shown. A sturdy rubber band for this purpose can be cut from a discarded inner tube. Handbills held in

this manner may then be removed, one at a time, from inside the packet without disrupting the remainder.

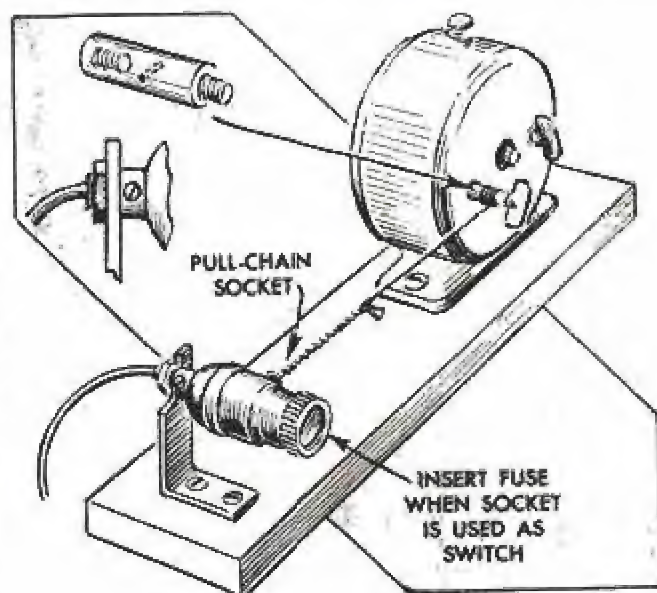
Toilet-Tank Sweating Prevented With Tepid-Water Supply

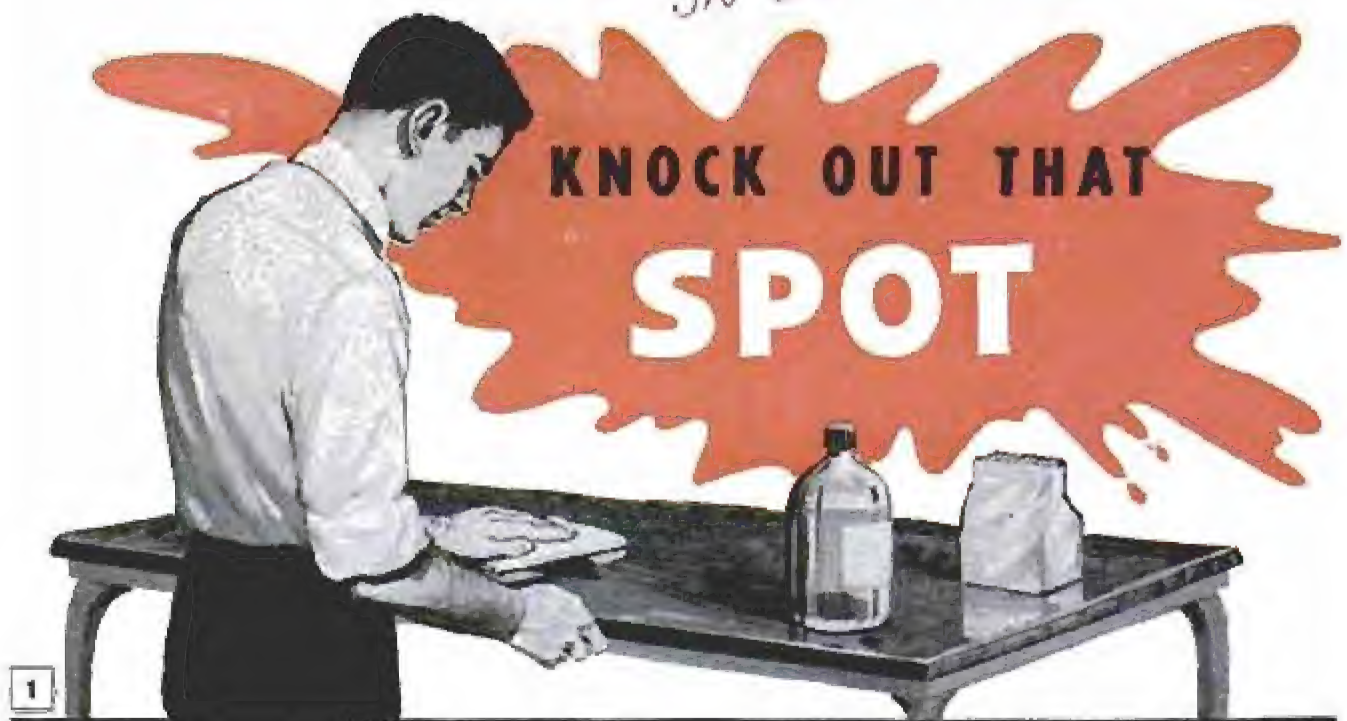
Condensation on a toilet flush tank was prevented by one homeowner, who installed an old hot-water tank in the basement, near the furnace, to feed warm water to the toilet. The tank was hung up under the ceiling, a water supply hooked to the intake, and a line run from the outlet to the toilet. Air temperature in the basement warmed the water in the tank, so that approximately 15 flushes in succession can be handled by the water supply.

W. H. Blair, Trail, B. C., Can.

Spring-Wound Alarm Clock Operates Pull-Chain Socket

A time switch that will turn a lamp, radio, or other electrical device on or off automatically can be made with a spring-wound alarm clock and a pull-chain socket, as shown in the illustration. An extension is added to the alarm-winding key to provide space for the string which is attached to the chain on the socket. A hole drilled across the extension permits tying the string so it cannot slip on the shaft. Screw a receptacle plug into the socket to accommodate the appliance cord.





By J. B. Mullen

ALTHOUGH THERE ARE many different staining materials that can cause spots or stains on natural and synthetic fabrics, painted surfaces, masonry and marble, most of these readily classify into types and for each one there is an effective solvent. The solvent can be any liquid used to remove a stain by dissolving it, washing it away by detergent action, or destroying it by chemical action. Table I lists common types of stains and suggests the types of solvents to use on washable and non-washable materials. Table II lists certain other stains that do not classify with major types, while Tables III and IV list types of

solvents and specific applications and show how to make up a handy household spotting kit, also pictured in Fig. 3. The tables are included merely for reference. They are not all-inclusive.

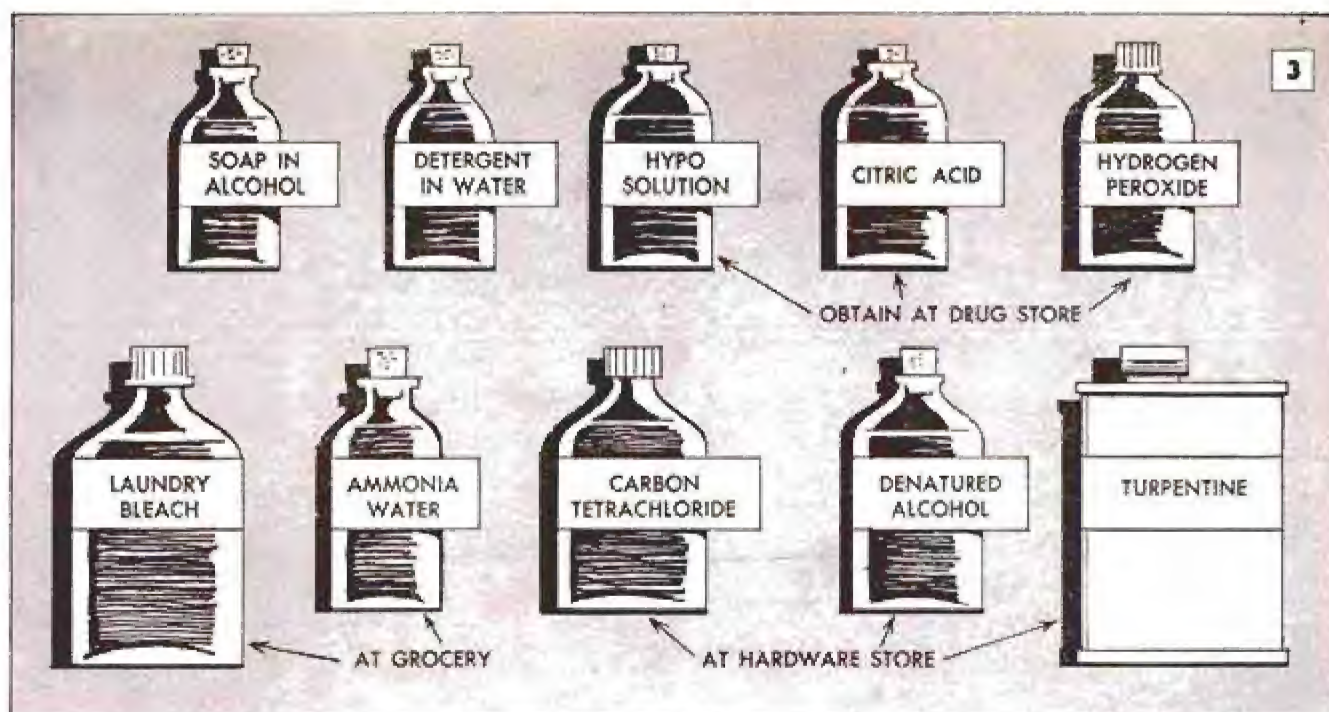
In removing stains from fabrics and certain other materials, there are two points to keep in mind. The first is that the spot may be caused by the combined action of several staining materials. Machine oil, for example, might include metal particles as well as carbon and perhaps acids. The second point to be remembered is that solvents which are harmless to one material may damage another. Because of this the choice



TABLE I—TYPES OF STAINS

Type of stain	Examples	Use solvent		Do not use
		On washable material	On nonwashable material	
Protein	Egg, meat, blood, milk, cream	Cold water, detergent	Cold water,* inert solvent, detergent	Hot water, heat in any form
Water-soluble	Sugar, syrup, candy	Water, detergent	Cold water*, inert solvent, detergent	
Greasy	Fats and oils, petroleum jelly, motor oil, tar	Grease solvent, detergent	Grease solvent	
Dye-type	Fruit stains, grass, dyes	Hot water, oxidizing	Warm water, oxidizing (mild)	Soap or alkaline substances
Starchy	Flour, starch	Hot water, detergent	Inert solvent, detergent, warm water*	
Solid soil	Mud, metal particles	Brush off, detergent, inert solvent	Brush off, detergent, inert solvent	
Iron (rust)	Rust	Acid	Acid*	

* Sometimes usable by sponging; test before using.



of a solvent is determined both by the stain and the fabric. As a rule, water or solutions in water can be used on washable fabrics, but are not effective on nonwashable fabrics except perhaps by light sponging. Carbon tetrachloride and other non-water-containing solvents are usable on both types of materials and are especially helpful on nonwashables.

Another important classification of fabrics is that between white and colored, or dyed. The inert solvents, water, detergent in water, alcohol, carbon tet and benzol generally can be used on white or colored fabrics, but active solvents such as alkali (ammonia or borax), citric and tartaric acids, laundry bleach and hydrogen per-

oxide usually will change the color of dyes. Avoid the use of these on dyed fabrics. In general, all common solvents can be used on cotton or linen fabrics without damaging the fibers. However, do not use the acid solvents. Alkalis and oxidizing solvents should not be used on silk or wool. Carbon tet is perhaps the only solvent in the spotting kit, Fig. 3, that can be considered safe on fabrics made from synthetic fibers. When any other solvent is used it should first be tested on a scrap of the material. Table III lists a number of solvents for use on different textiles.

There are four methods of applying solvent to fabrics to remove stains. These are the application of pressure, soaking,

TABLE II—MISCELLANEOUS STAINS

Stain	How to remove it
Oil paint—fresh	Remove oil with turpentine or benzol, then launder or (on non-washables) use carbon tetrachloride
— old	Soak in ammonia or borax, launder. Or: soak in benzol
Water paint—fresh	Use water, detergent solution, ammonia
— old	Soak in ammonia
Iodine	Use hot water, or alcohol; on starched material, use hypo
Silver stains	Use hypo (usually requires soaking)
Lipstick	Rub with lard or petroleum jelly, use grease solvent or detergent
Coffee, tea	Hot water; if spot remains, use oxidizing solvent
Wax (paraffin, candles)	Chill if necessary, and scrape off as much as possible. Remove the rest with carbon tetrachloride
Gum	Scrape off as much as possible; then use carbon tetrachloride
Perspiration	Use detergent, then laundry bleach; or sponge alternately with vinegar and ammonia
Scorch	Use mild oxidizing agent, or moisten and place in sun (permanent on silk and wool)
Mildew	Detergent; then use laundry bleach, or hydrogen peroxide
Ink	Apply citric acid or oxalic acid; or apply these alternately with laundry bleach. Many colored inks can be removed with water or alcohol.
Note: Before using the solvents, be sure that they are safe on the material (See Table III)	



WHEN REMOVING SMALL SPOTS
HOLD MATERIAL OVER CUP OR
TUMBLER AND SPONGE



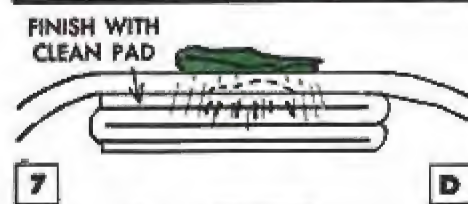
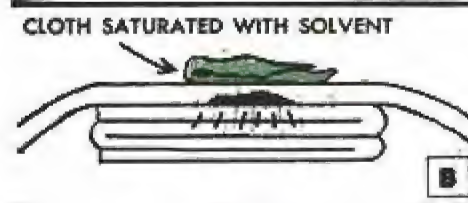
and front and back-sponging. The first refers to the use of water as a solvent. Hold the spotted portion of the cloth under the faucet and turn on the cold water. Often it will help to use embroidery hoops to hold the stained portion of the fabric taut, Fig. 2. In some cases moderately hot water is more effective. Of course, this method is only usable on washable materials and where water can be used as a solvent. Soaking generally means placing the stained portion of the fabric in a small bowl, Fig. 6, and immersing the spot to give the solvent a longer time to work. Often this procedure will need to be followed by sponging to remove rings. It also is effective when using the acid solvents and oxidizing solvents such as hydrogen peroxide, which often require time to act fully.

Sponging is the common method of rubbing the stained fabric lightly with another cloth saturated with a solvent. Many non-washable materials can be sponged in this manner without damage and the grease solvents, such as carbon tet, are most often applied by front-sponging; that is, the solvent is applied to the face of the fabric, Fig. 5. In back-sponging, the solvent is sponged onto the reverse side of the fabric. If the spot is small and covers only a small area, it often helps in either front or back-sponging to stretch the material over the top of a cup or tumbler as in Fig. 4. A more effective method in removing large spots is detailed in Fig. 7, A to D inclusive. Here the material to be sponged is inverted over a pad of clean cloth or blotting paper and back-sponged with a saturated pad. This method has the advantage, especially when treating large spots, of carrying the staining material out of the fabric and into the absorptive pad on the face side without forming rings difficult to remove from the

thicker fabrics. As a rule it is necessary to change the absorptive pad at least once and often two or more times to assure complete removal of large spots containing a considerable amount of staining material. Some users of this method prefer a cotton pad rather than a folded cloth pad for applying the solvent. In using the cotton pad, a somewhat greater amount of solvent can be concentrated in a small area. Fold the cotton pad in a square of lintless cloth.

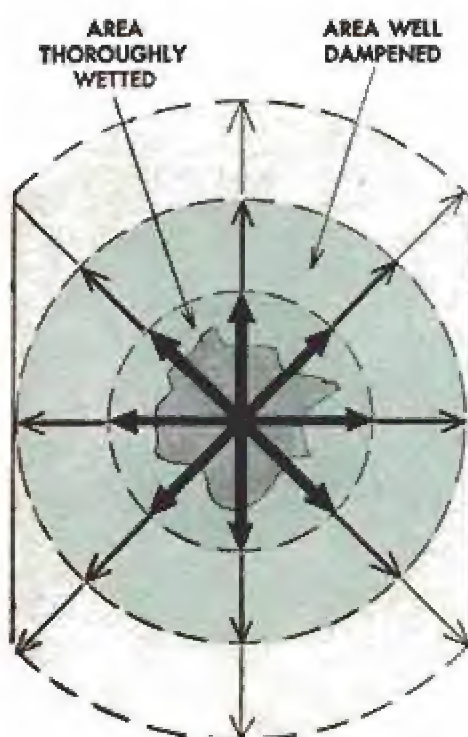
Rings, formed by the solvent carrying a portion of the stain away from the center of the spot, can be prevented by sponging away from the center of the affected area, working in one direction only and not rubbing back and forth, Fig. 8. On lighter fabrics the rings often are made more conspicuous simply by the contrast of the cleaned area with the rest of the garment.

Many types of stains on materials other than fabrics can be removed simply by washing with a mild detergent. Where oily substances have penetrated and stained painted wood and concrete floors, a "poultice" consisting of an oil solvent mixed with an absorbent material, such as corn meal or whiting, is quite effective. Stains on the marble tops of old tables often can be removed by this method. Sometimes it is best to dust an absorbent material on marble and then apply a pad saturated with a solvent, Fig. 1. The pad tends to retard evaporation of volatile solvents. Although highly flammable, naphtha is perhaps the best for the purpose on most surfaces treated in this manner as it does not soften common finishing materials and it will not damage ordinary marble. Use naphtha outdoors. Ordinary stains that have penetrated brick and stone masonry generally can be removed by poulticing. In some cases simply scrubbing with a detergent solution will prove effective. ★ ★ ★



Back-sponging with absorptive pad placed against face side of material is a good method of removing stains on most fabrics, especially those stains covering a fairly large area

Trick in rubbing out stains by the pressure method, using a pad, is to make straight, one-way strokes away from center of stained area. Method prevents formation of rings



ARROWS INDICATE DIRECTION OF RUBBING. WEIGHT OF ARROWS SHOWS DEG. OF SATURATION

SEPTEMBER 1956

TABLE III—SOLVENTS AND THEIR APPLICATIONS

Solvent class	Name of solvent	Type of stain	Safety of use on textiles					
			Cotton	Linon	Colored Cotton	Silk	Wool	Synthetic
Cold water		Protein-type	A	A	B	B/C	B/C	B/C
Hot water		Fruit, etc.	A	A	B	B/C	B/C	B/C
Inert solvents	Carbon tetrachloride*	Greasy type	A	A	A	A	A	A
	Benzol	Greasy, paint	A	A	B	A	A	B/C
	Turpentine	Paint	A	A	A	A	A	B/C
	Alcohol (or methanol)	Grease; also other stains	A	A	B	A	A	B/C
Oxidizing solvents	Laundry bleach	Fruit, dye-type, etc.	B	B	N	N	N	C/N
	Hydrogen peroxide*		A	A	C/N	C	C	C/N
Detergents	Detergent solution	Greasy type solid soil, etc.	A	A	B	B	B	B
	Soap in alcohol*		A	A	A	A	A	A/B
Acids	Citric acid, oxalic acid, tartaric acid, acetic (vinegar)	Iron, rust alkaline stains	B	B	C	B	B	C/N
Alkali	Ammonia water	Acid stains, perspiration	A	A	C	C	C	C/N
	Barax solution		A	A	C	C	C	C/N
Reducing solvents	Hypo solution	Silver stains, iodine	A	A	C	B	B	B/C
Lacquer solvents	Acetone	Lacquer, nail polish	A	A	B	B	B	C/N
	Lacquer thinner		A	A	B	B	B	C/N

A — Nearly always usable

B — Usually usable, at least by sponging

C — Sometimes usable; try cautiously, by sponging

N — Not safe

* Mildest solvent of its class; best choice for delicate materials

TABLE IV — "SPOTTING KIT" SOLVENTS, AND HOW TO PREPARE THEM

Solvent	Class	Obtain from	How to prepare	Substitute solvents
Carbon tetrachloride	Inert solvent (grease)	Hardware or drug store	Use as purchased	Benzol, naphtha
Turpentine	Inert solvent (paint)	Hardware store	Use as purchased	Mineral spirits, V.M. & P. naphtha
Hydrogen peroxide (3%)	Oxidizing	Drug store	Add a drop of ammonia to a portion just before using	
Laundry bleach (Sodium hypochlorite)	Oxidizing	Grocery	Use 2 to 4 tbsp. in a pint of water	
Detergent solution	Detergent		Dissolve 1 tsp. of mild detergent in ½ pint water	Liquid shampoo
Soap in alcohol	Detergent		Dissolve 1 tsp. of mild soap flakes in ½ pint alcohol	Tincture of green soap
Citric acid	Acid (esp. for iron)	Drug store	Dissolve 1 tbsp. of crystals in ½ cup (4 oz.) of water	Oxalic acid, tartaric acid; or acetic acid, 5% (white vinegar)
Ammonia water	Alkali	Grocery	Use as purchased	Barax solution (2 tbsp. in a pint of water)
Hypo (sodium thiosulphate)	Reducing	Drug store	Dissolve 4 tbsp. in a cup (8 oz.) water	
Alcohol (denatured)	Inert solvent	Hardware store	Use as purchased	Methanol (wood alcohol)

Bolts Through Ends of Bed Slats Keep Rails From Spreading

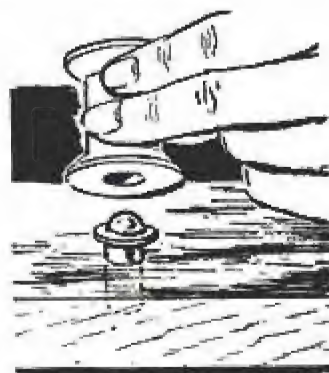


Bed rails may be held together by inserting stop pins, made from bolts, in holes drilled at the ends of the slats and partly through the rail cleats. With the bolts in place, the bed is easily moved without dropping the spring and mattress.

Victor H. Lamoy, Upper Jay, N. Y.

Thread Spool Aids in Driving Bullet-Type Latch

When driving a bullet-type cabinet latch, the sleeve will not be crushed if one end of a wooden thread spool is held on the flange. To insure trouble-free operation, depress the ball and apply a drop of oil.



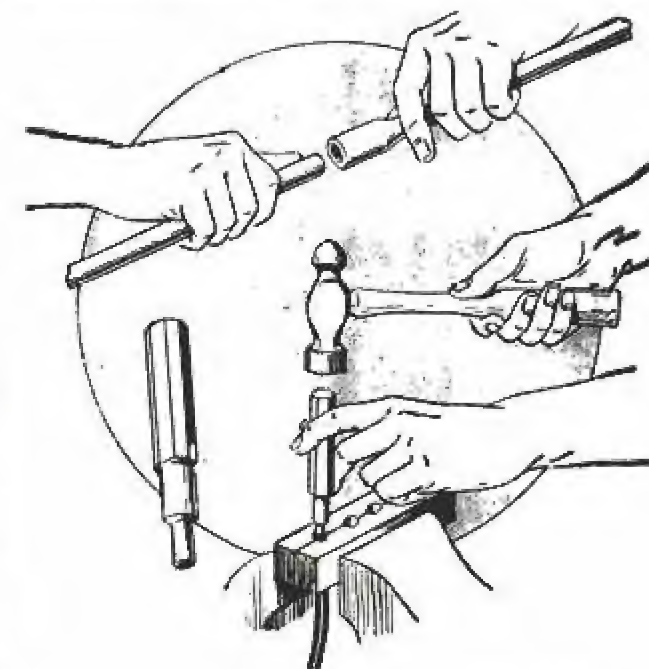
Appliance Cords Stored In Mailing Tubes



Cords from a toaster, iron and other small appliances won't get snarled together in the storage drawer if each cord is folded and a piece of cardboard tube is slipped over it. A coat of shellac will strengthen the cardboard.

Salt Shaker Dispenses Pumice

The next time you use powdered pumice stone or other powdered abrasive for rubbing down furniture surfaces to a smooth satiny finish, try a salt shaker as a dispenser. Besides being convenient, the shaker assures uniform distribution, which counts in getting superior results.



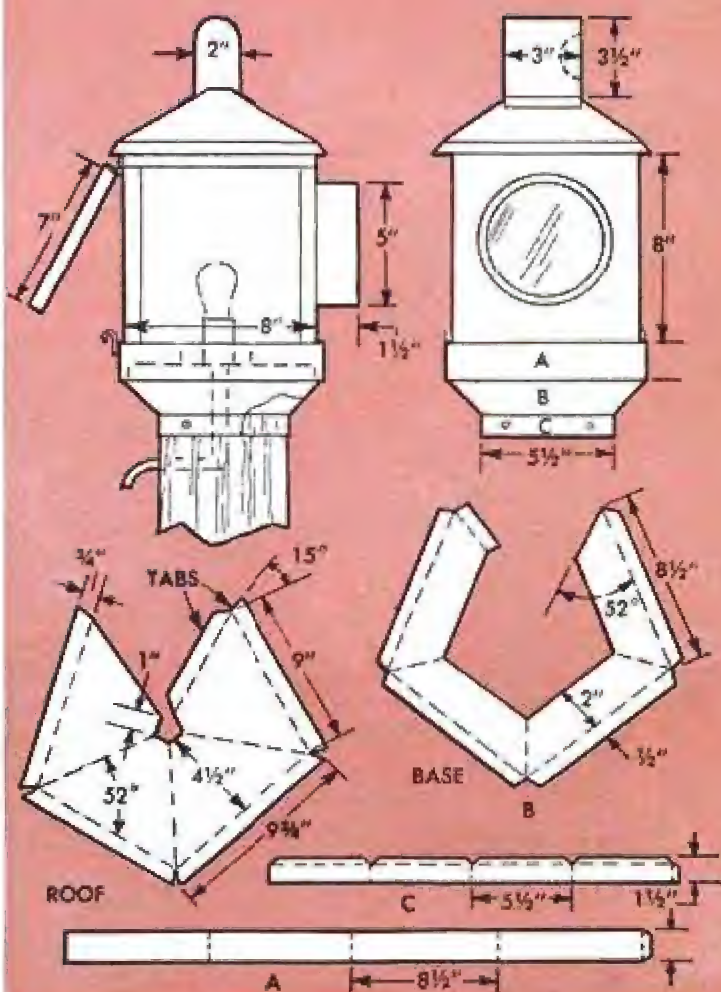
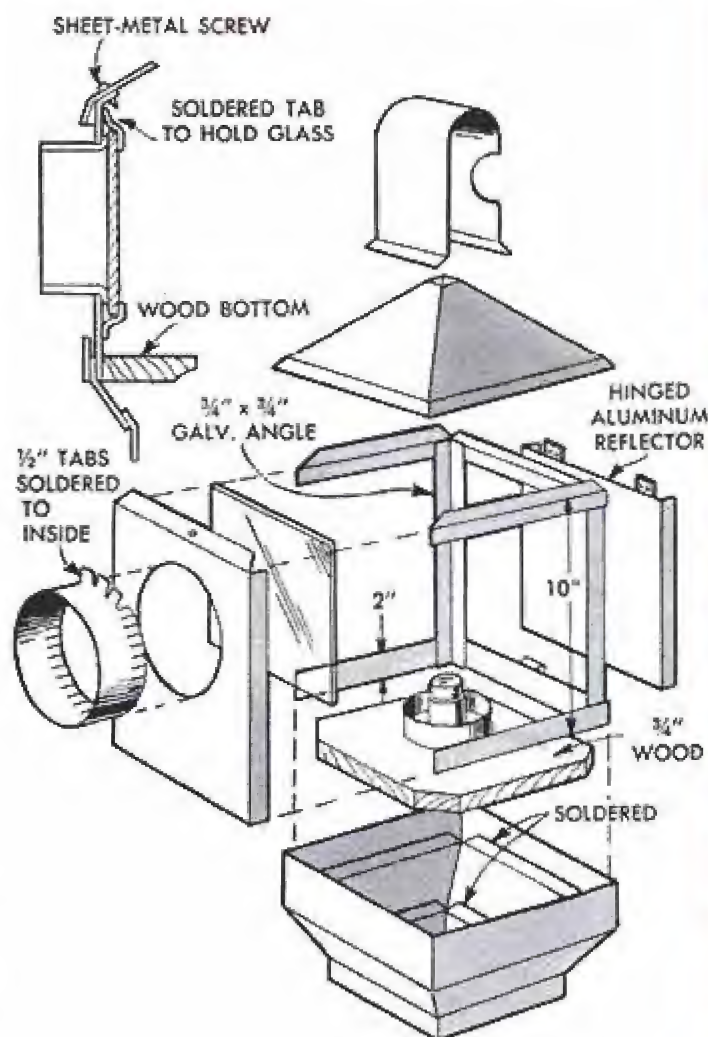
Swedged Joints for Copper Tubing

When joints in copper tubing occur in locations where it is impossible to join the two ends in the regular way with a coupling or union, swedged joints can be used. Swedging consists of enlarging the end of one tubing so it will slide snugly over the end of another tubing as shown. To do this quickly and accurately, clamp the tubing in a flaring block mounted in a vise and tap a swedging punch into it until the diameter is large enough to accommodate the other pipe. Clean both inside and outside contacting surfaces of the tubing and carefully sweat-solder the joint to make it leakproof.

Gatepost Light Simulates Old Locomotive Headlamp

RESEMBLING the headlamp from an old wood-burning locomotive, this gatepost light was made by a model-railroad enthusiast to illuminate his house number. Smaller in size than the original lamp, the major construction change was substitution of electrical light for the kerosene lantern.

All metal parts are galvanized sheet metal which can be readily soldered. The base is assembled first from the three pieces marked A, B and C. Overlapping tabs are soldered to the adjoining piece. The light chamber is framed with $\frac{3}{4}$ -in. galvanized angle and a faceplate of sheet metal in which a 5-in.-dia. hole has been cut. Fitted into the hole is a 2-in. length of stovepipe with $\frac{1}{2}$ -in. tabs cut along the inside edge. An aluminum reflector is hinged to the opposite side of the light chamber to provide access for changing the bulb. A spring catch locks it shut. Individual metal tabs, soldered to the frame, hold the front lens and side windows in place.





WTM 58

"Rolling Dinette" Has Drop Leaves

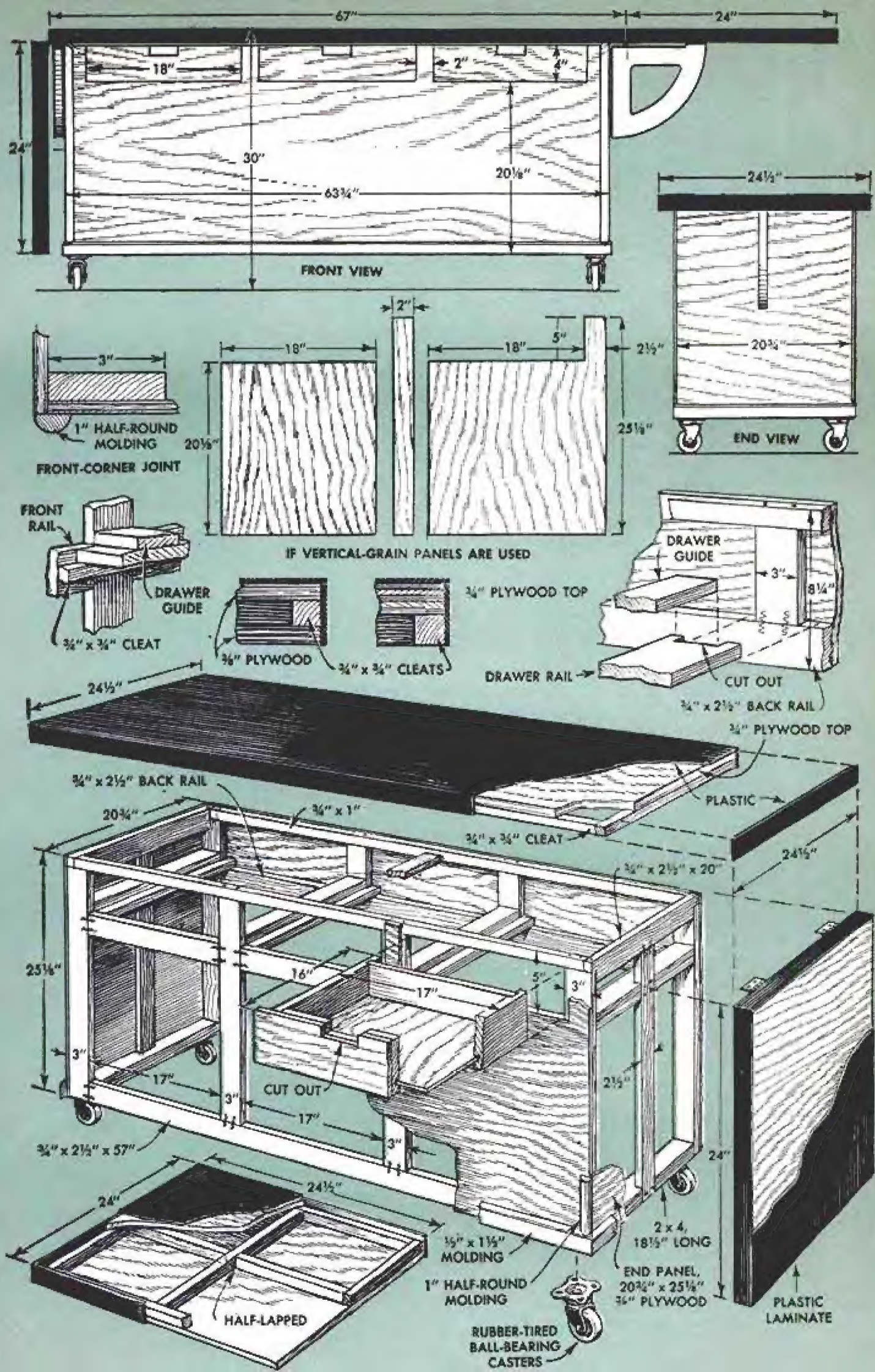
By Hi Sibley

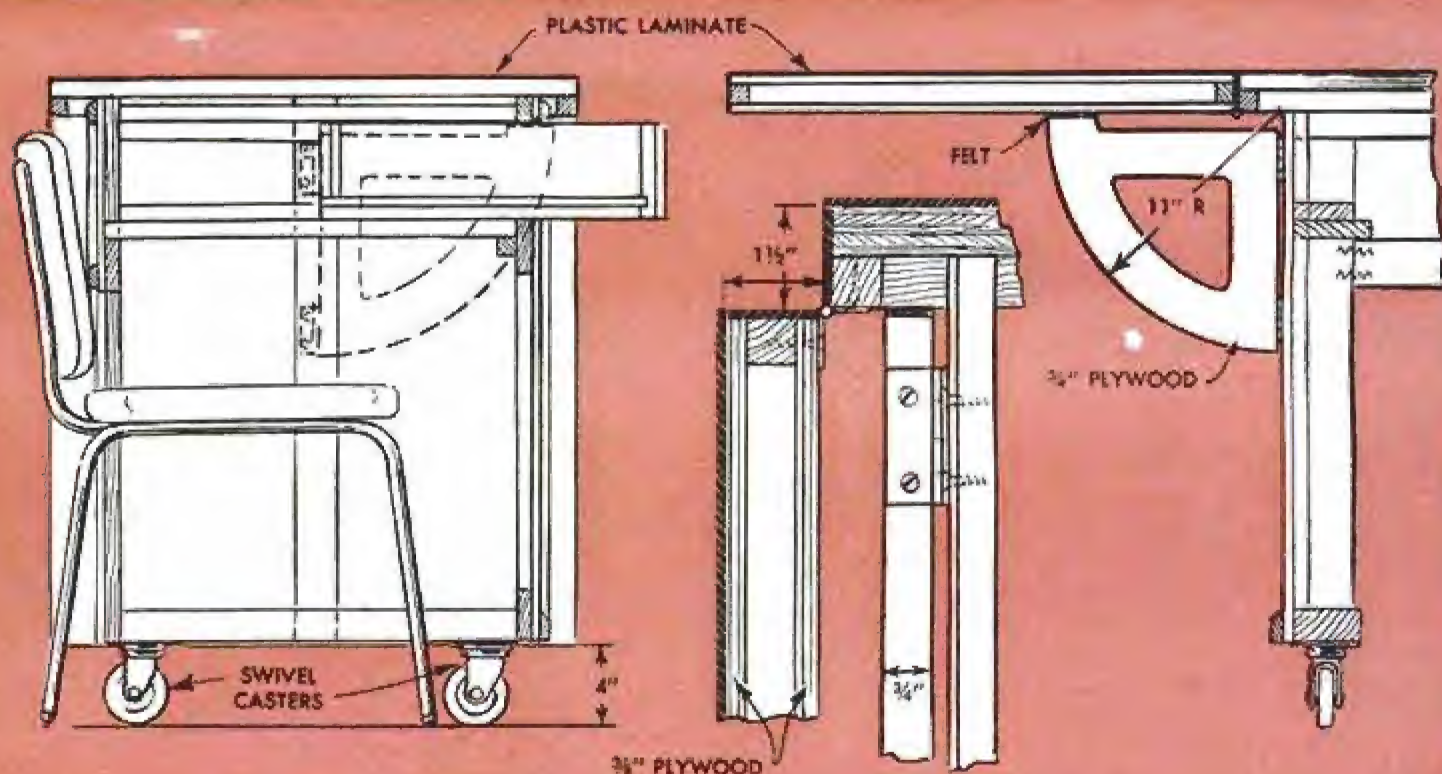
IN THE HOME or apartment where dining space is limited, this narrow drop-leaf table on casters provides a means for serving guests on special occasions yet occupies a minimum of space when not in use. An eye-catcher with its natural finish base contrasting with the plastic-laminate top, the table is used to conceal three extra chairs when placed against the wall. Silverware and linen may be kept conveniently in the three matching drawers.



To make the table, first assemble the front and back frames using corrugated fasteners on the inside to secure the butt joints. If equipment is available, a more sturdy construction is possible with half-lap or mortised joints. Next, glue on the plywood paneling after first cutting out the openings for the drawers. Cut out each piece accurately so it can be used on the front of the corresponding drawer, resulting in a continuous grain effect. On the opposite page dimensions are given for both vertical and horizontal application of the paneling. Plywood glued to the back frame should extend down the corner members to the bottom.

Join the front and back sections together with the built-up end frames and then install the four drawer guides. The guides are nailed to the drawer rails which are cut to fit around the short vertical braces at the back. The drawer rails rest on $\frac{3}{4}$ x $\frac{3}{4}$ -in. cleats nailed to the front framing, and on the horizontal rail running just above the kneehole opening at the back. To prevent the drawers from tipping down when pulled out, slides are nailed between





the front and back frames at the top. Drawers are then constructed to fit the openings and faced with the plywood pieces saved for that purpose. Instead of the handhole pictured at the top front edge, a small inconspicuous knob may be attached to the front of each drawer. The end panels, cut to overlap front and back, are then glued in place. Doorstop molding is used to trim the bottom edge of the table, and a half-round molding run above the drawers and down the corners covering the edge of the plywood ends. Now turn the table upside down and attach the casters.

Fir plywood, good one side, is used for the top and each drop leaf. The sheet for the top is $\frac{3}{4}$ in. thick. Cleats, $\frac{3}{4} \times \frac{3}{4}$ in., are nailed along the edge. Fabricate each drop leaf by nailing a piece of $\frac{3}{8}$ -in. plywood to each side of a frame made from $\frac{3}{4} \times \frac{3}{4}$ -in.

stock. The plastic laminate is attached to the top surfaces and to all of the edges with a contact adhesive. Attach the edging strips first, mitering at the corners. The top is then fastened in place with screws from inside the counter. Butt-hinge a leaf to the underside of the top at each end. Leaf supports cut from 1 x 12-in. stock are hinged to the end panels slightly off center to keep them from projecting beyond the front of the table when the leaves are down. A piece of felt glued to the support rest prevents it from scratching the underside of the leaf.

For family meals the table may be turned around so that the drawers face the wall giving plenty of legroom. When guests arrive, it's a simple matter to wheel the table out into the center of the room and expand it to full length. ★ ★ ★

Paint Scraper Easier to Use When Fitted With Knob

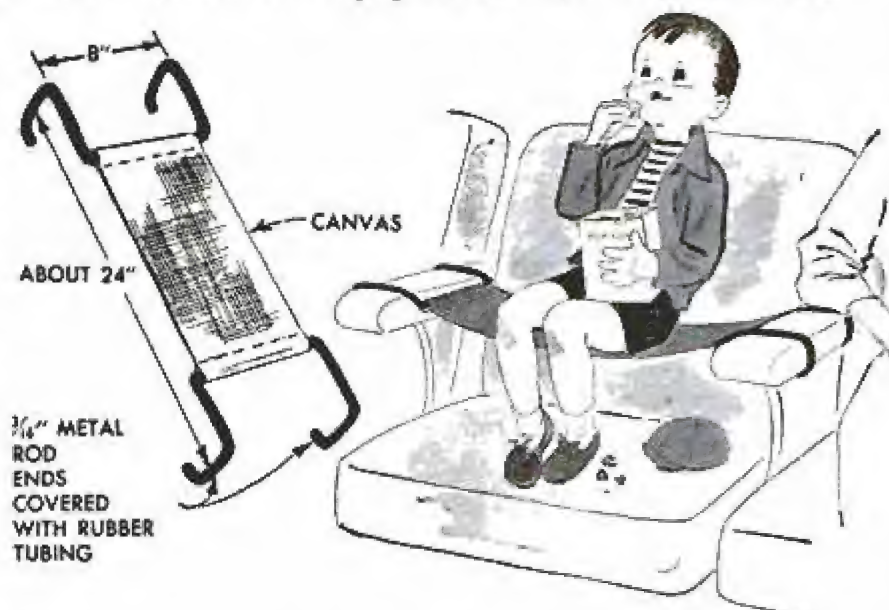
Reduce hand cramp and provide better control of a paint scraper by adding a knob to the top as shown. Both hands then can be used, which permits applying extra pressure on the scraper when necessary. The knob is a large drawer pull. Replace the short screw holding the scraper plate to the handle with a longer one, and screw the knob onto the projecting end.

¶ To extend the life of a candle, give it a coat of white varnish and allow it to dry for several days. Not only will the candle last longer, but it will drip less.

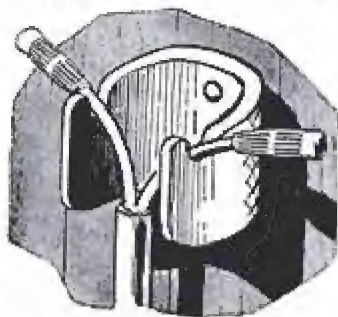


Folding Seat Permits More Movie Enjoyment for Small Tots

Why not provide more comfort and enjoyment for your youngster when he is viewing a movie in the neighborhood theater by raising him up on this folding canvas seat that hooks over the armrests of a regular seat? A piece of canvas, 8 x 18 in., is hemmed to accommodate two $\frac{3}{16}$ -in. metal rods, the ends of which are bent to form hooks that fit snugly over the armrests. Be sure to slip the rods through the hem before bending the ends. Cover them with rubber tubing.



Notched Section of Auto Tire Supports Mower Against Wall



A lawn mower that has a fork-type handle can be kept against the wall of a garage or tool shed by a holder cut from a section of auto tire. After the tire section is cut to the shape shown, it is

nailed to a wall stud at a height that holds the lawn-mower handle in the desired position. Bending the flexible holder permits easy removal of the handle.

Mileage Record on Ground-Glass Strip Glued to Speedometer

Provide a handy place to jot down the mileage when changing oil in your car by gluing a small strip of ground glass to the face of the speedometer with transparent cement. Due to its translucent characteristic, the ground glass will be backlighted at night and reflective-lighted by day. Place the frosted side out, to permit writing with a soft, lead pencil. Be sure not to cover indicators for bright lights or turn signals. The strip can also be used to record trip mileage and gasoline input relative to mileage. Markings no longer needed can be easily erased.

Ken Hadenfeldt, Storm Lake, Iowa.

Reshaping Worn Paintbrush

A worn or misshapen paintbrush can be restored to usefulness by trimming it back to shape. You can do a neat job of trimming by holding a razor blade against a pocket comb, illustrated at right, and gently drawing the comb through the bristles. Stray bristles can also be removed by this method.—Ken Murray, Colon, Mich.

Heavy Soap-Water Application Reveals Gas-Line Leaks

Gas leakage from pipes and fittings can be detected by brushing a film of heavy soap water over the suspected area. A leak, even a small one, will cause a bubble to form in the enveloping soap film. Though ammonia is frequently used for this purpose, because the fumes turn white when gas is present, soap water is a satisfactory substitute. Do not attempt to repair leaks while gas is present in the line.



FRESH VEGETABLES

ALL YEAR 'ROUND

By William Gilman

HOW WOULD YOU like to have fresh vegetables from the garden every month of the year, without the expense of storing them in a freezer? With proper storage methods, much the same as produce companies use, radishes, celery, cabbage and other vegetables can be picked at the end of the growing season, packed in boxes in dry leaves or moss and stored.

The majority of winter keepers—rooty vegetables like carrots and beets, or leafy ones, such as cabbage and celery—need a cool, humid atmosphere to keep them fresh. One caution about celery: The flavor of celery is affected by turnips and cabbage when stored next to them.

Storage Bins

First, make several storage bins of the type shown at the bottom of the next page. The bins can be made of rough lumber with large screen panels at the sides and top to provide ventilation and keep pests out. Casters installed on the bottom of each bin permit them to be moved around on concrete floors when cleaning.

Crisp oak or maple leaves are excellent storage medium when 1-in. layers of them are used to separate vegetables. The leaves provide sufficient air space for ventilation, yet retard dehydration



Above, thin coating of wax on severed ends of root vegetables prevents rapid loss of moisture. Below, cabbage packed between layers of peat moss in vegetable bin remains solid and fresh throughout winter



The vegetables should be packed between 1-in.-thick layers of fresh oak or maple leaves or peat moss to provide sufficient ventilation, yet prevent excessive evaporation. A cool corner in the basement, where the temperature remains about 50 deg. F., is an ideal place to keep the bins.

Seal Cut Ends of Beets

Thick-skinned root vegetables, such as beets or rutabagas, will last through the winter without turning spongy or rotting, if the tops and root ends are cut off and the ends dipped in melted wax. When the wax cools a protective seal is left over the severed ends so that the vegetables will keep until spring without becoming dry or wilted.

Tomatoes that are still green just before the first frost arrives can be picked, individually wrapped in newspaper and placed in shallow wooden cartons. Stored in a dark corner of the basement, they will be a source of fresh tomatoes for several weeks.

Another way to "beat the frost" at harvest time is to pull the entire tomato plant from the ground and hang it in the basement. The same thing can be done with peppers. Fruits that are full-grown will continue to ripen much the same as they would under normal growing conditions.

When harvesting squash and pumpkins, pile them in a sunny spot near the house so they can be easily covered on frosty nights. After the squash and pumpkins have "cured" in the sun for a week or two, store them indoors in a dry, frostproof place. ★ ★ ★



Entire tomato and pepper plants with unripe fruit attached are hung in dark corner of basement. Full-grown fruit ripen much the same as under normal growing conditions for fresh post-season supply

Vegetable storage bins are made of rough lumber with screen panels for ventilation and to keep pests out. Two handles on one side and three casters on bottom facilitate moving them when necessary



Paper Clamp on T-Square to Rule Parallel Angular Lines



By fitting a paper clamp on the head of a T-square as shown and butting it against the edge of the drawing board you will be able to draw parallel angular lines more rapidly than with the aid of a triangle. The clamp may be adjusted for ruling lines at any desired angle. To assure parallel ruling, always butt the end of the clamp against the edge of the drawing board.

Felt Pads Under Furniture Legs Prevent Damage to Tile Floors

Furniture to be placed on a tile floor, and particularly on rubber tile, should be equipped with felt pads under the legs to prevent damaging the floor. Before gluing the felt in place remove glider buttons, if any, that are attached to the legs. Gliders dent the tile and may also scratch the surface.—Alexander Owen, Schenectady, N. Y.

Index Notches in Reference Books Cut With Wood Gouge

If you have frequent occasion to refer to a book that is divided alphabetically or according to subjects, and yet do not want index tabs projecting from the pages, cut thumb notches in the edge of the book and print reference marks in them. Cut the notches with a wood gouge having a radius of about $\frac{1}{2}$ in. Use a piece of $\frac{1}{8}$ -in. hardboard or plywood as a stop for the gouge, placing it on the sheet that is to bear the reference mark. Drive the gouge in at a slight angle towards the book binding.



Old Chest of Drawers Converted to Desk for Young Child or Family

An old chest of drawers is a good basis for a desk for a child's room, and may even be converted to a writing desk for the entire family. The first step is to remove the lower drawers, including the rails and sup-

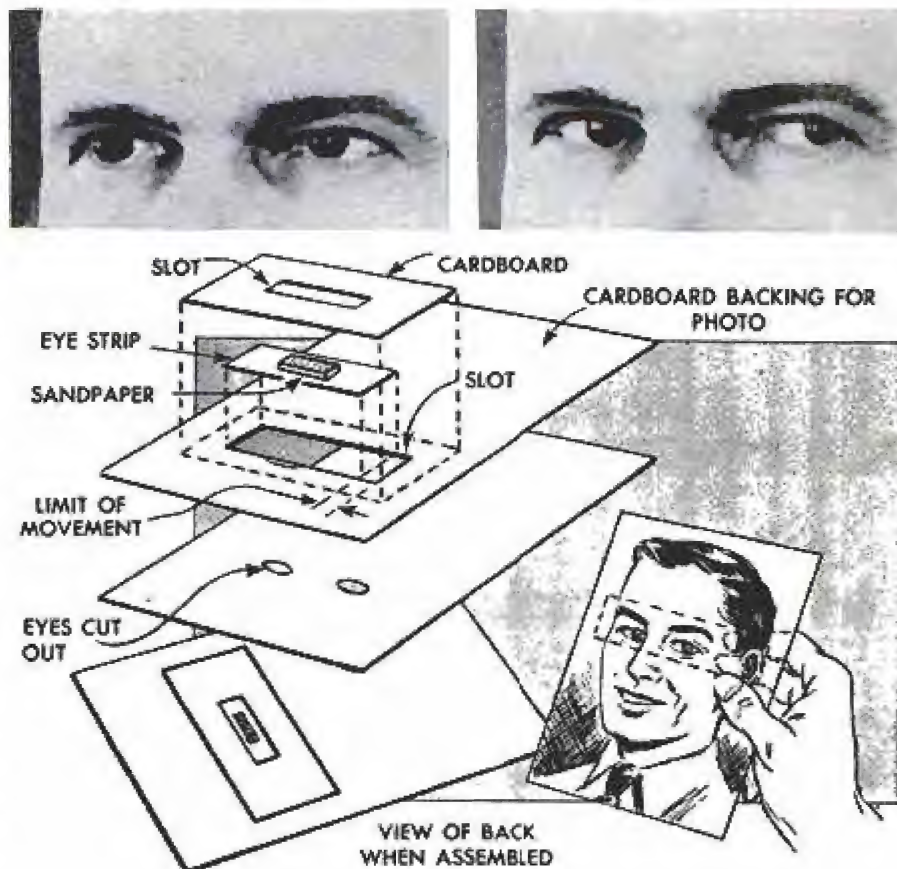
ports inside the chest, but leaving the top drawer intact. Side and back panels are left intact, but the legs should be cut down so that the top is at a comfortable level for writing—about 24 in. for children and 30

in. for adults. Replace the bar or pendant type handles on the top drawer with round wood or metal knobs, but before installing them take off the old enamel or varnish with paint remover. Fill handle holes in drawer, and other indentations left by removal of bottom drawers, with a wood filler and sand the surface smooth. Finish with two coats of varnish or paint to match other furnishings in the room.—E. A. Brinton, Salt Lake City, Utah.



"Doctored" Portrait Has Eyes That Move Realistically

Surprise your friends by showing them a portrait that appears normal but suddenly has unsuspected lifelike movement of the eyes. You will need two duplicate prints of a full-face portrait. Cut a horizontal strip including the eyes from one print. Then using a sharp knife cut out the eyes on the other print. Glue a cardboard backing to this second print that has a slot cut slightly longer than the strip removed from the other print. Glue a piece of sandpaper to the back of the eye strip and place it in the slot. Next cut a narrower slot in another piece of cardboard and glue it over the strip as shown. The exposed sandpaper permits manipulation of the eyes.

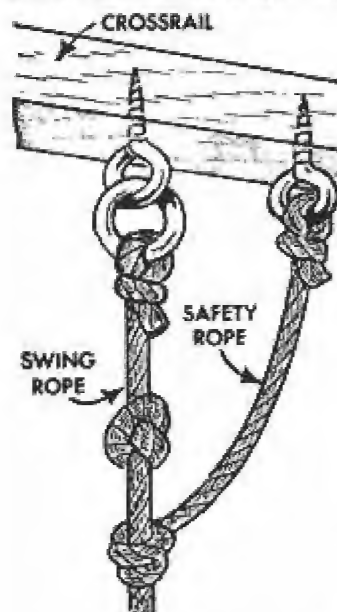


Vacation Address Book

Next time you go on a vacation trip, there will be no problem of remembering the addresses of friends to whom cards and souvenirs are to be sent, if a local telephone directory is taken along for a reference. Also, it is quicker to look up a home-town phone number in your personal copy than to have to hunt through mutilated out-of-town directory in a phone booth.

Walter E. Burton, Akron, Ohio.

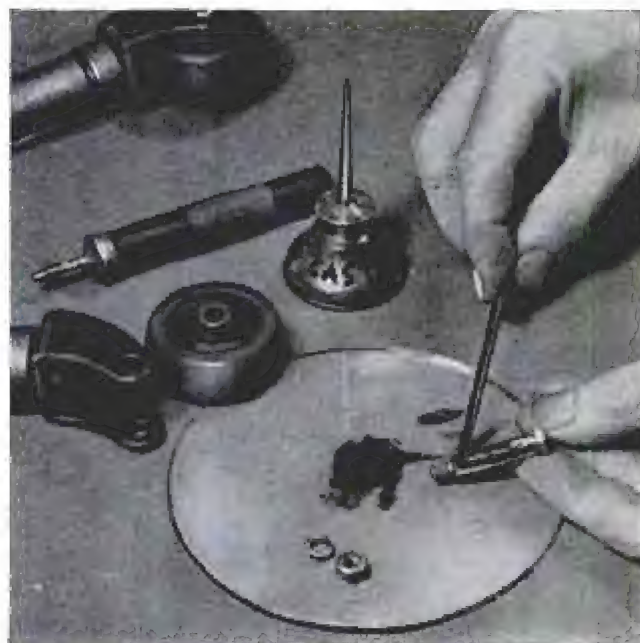
Safety Ropes on Swing Prevent Sudden Falls



Sudden falls from swings caused by breakage of the rope or a hanger can be avoided by installing auxiliary safety ropes as illustrated. Be sure to tie a knot in each swing rope immediately above the point where the safety rope is attached. Leave a little slack in the safety ropes to permit movement of the swing ropes.

Castor Oil and Graphite Mixture Lubricates Rubber Casters

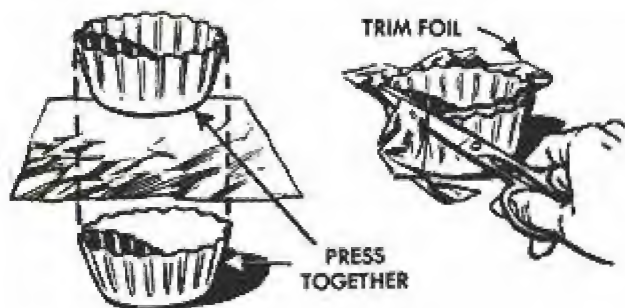
Castor oil to which some colloidal graphite has been added can be used to lubricate casters having rubber wheels. This non-mineral oil is considered more satisfactory in such applications than are conventional lubricants, which have a softening effect on rubber compounds. If the caster can be taken apart, the special mixture may be applied directly to the bearing surfaces as shown. If not, an oil can or wire applicator is used.



SOLVING Home Problems



ROLLER FOR PAINTING SCREENS is improvised from 4-in. length of 1-in. dowel covered with old pile carpet. Length of heavy wire and dowel serve as a handle



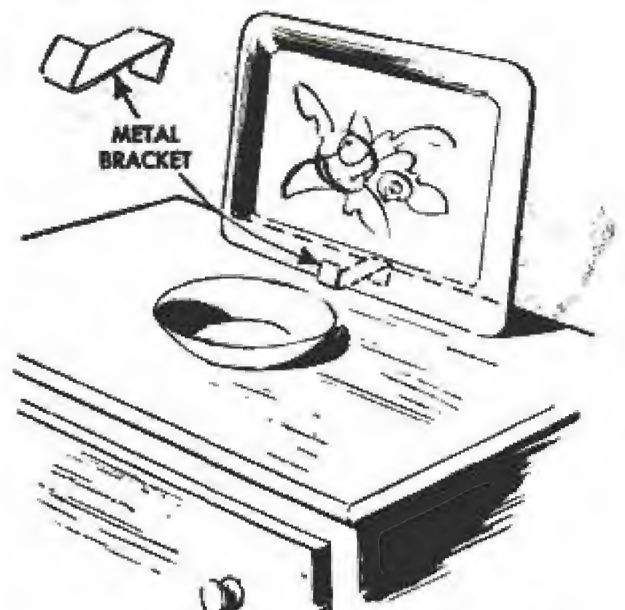
PAPER EGG CARTONS can be reused again and again for storage if coated with water glass. Before coating, reinforce hinge with cloth, using water glass as glue



BLACKBOARD on panel of kitchen-cabinet door is handy for jotting down reminders, grocery lists. Use a blackboard paint that dries with "toothed" surface

MUFFIN TINS can be used to mold nut cups from aluminum foil. Place foil over one of the tins. Press second tin into first tin to form foil. Trim edge

METAL BRACKET bent to S-shape holds a decorative tray edgewise on bookcase or mantel. When bending bracket, be sure there are no sharp edges to mar finish

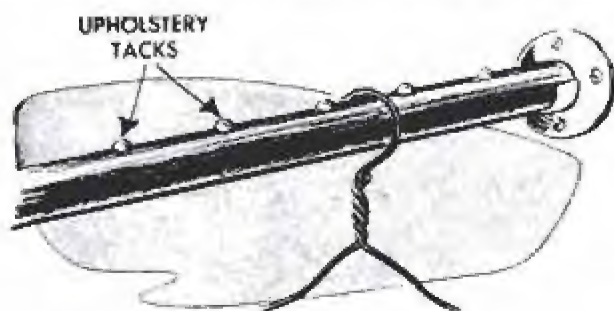




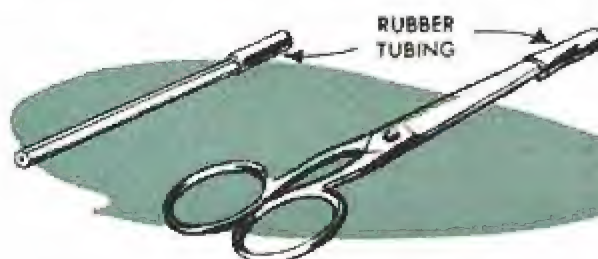
SMALL PIECE OF CLOTH rolled tightly and inserted in hole in a thread spool keeps needles safe, always at hand when needed. Needles can be kept threaded



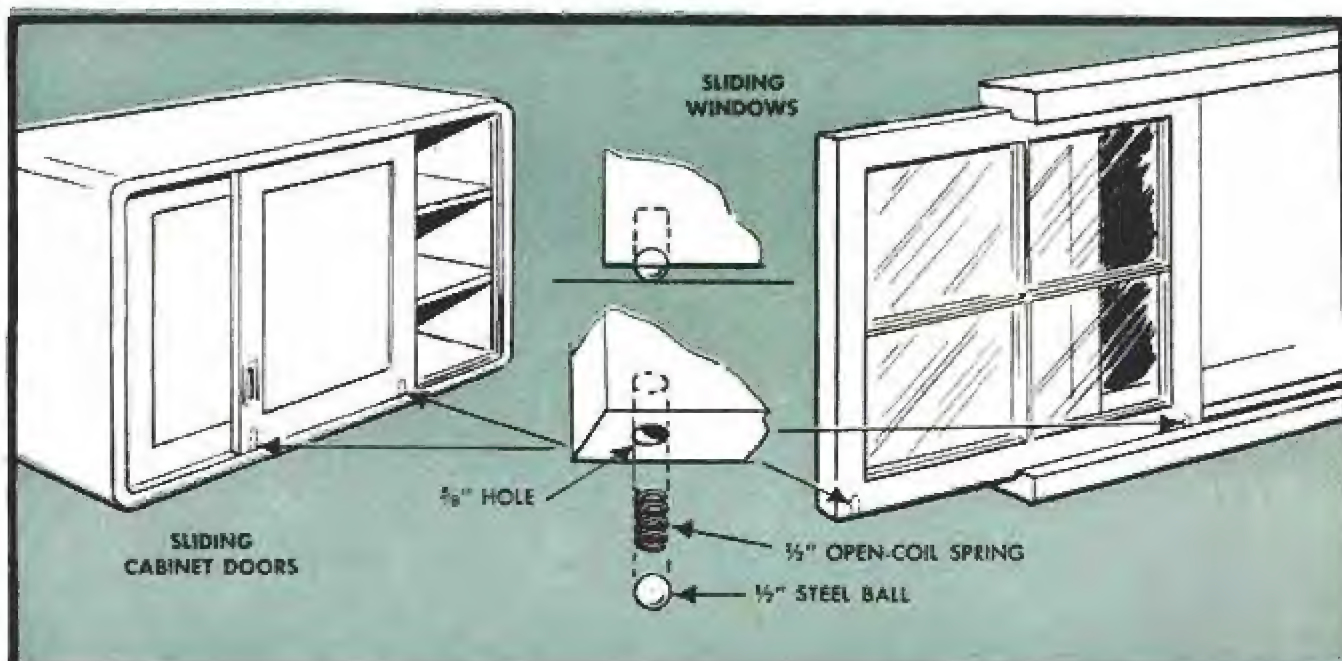
HARDENED PAINT SPOTS in fabrics can be removed by first breaking paint film with putty knife. Then apply solvent such as turpentine or lacquer thinner



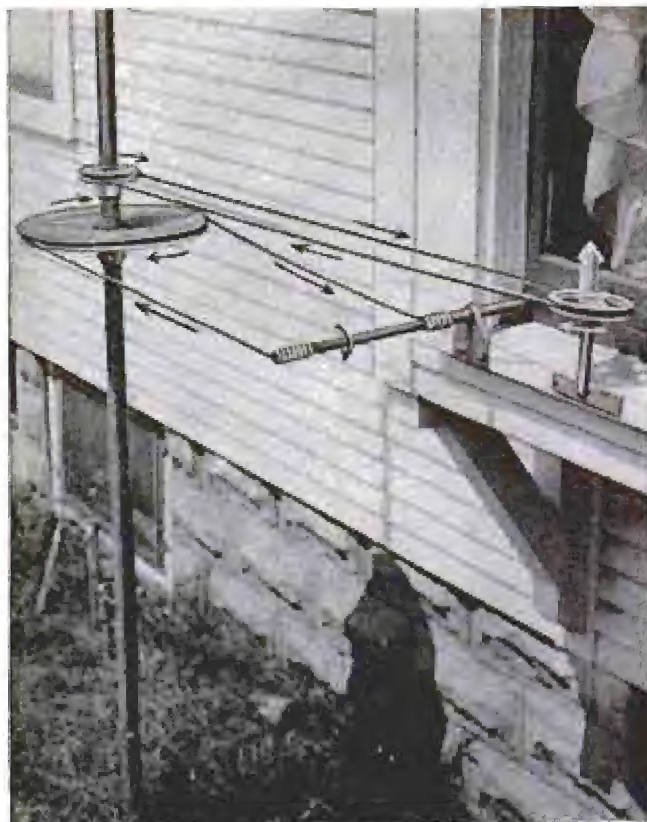
ROUNDHEADED UPHOLSTERY TACKS driven into top side of a wooden clothes rod space clothes hangers equidistantly, making it easy to locate the garments



SCISSORS are made safe and at the same time protected from damage in drawers by slipping rubber tubing over the closed points. Also protects pencils



Hand-Rotated Television Antenna Operated From Inside House



A hand crank inside the window rotates this TV antenna for better reception. The crank rests on upright supports and the window sash is slotted to fit over it. A large pulley is fitted to the antenna-mast level with the extending rod of the crank, and a small pulley fitted just above it. Another pulley, the same diameter as the small one on the mast, is mounted on a vertical shaft attached to the edge of the window sill. Plastic-covered clothesline is brought around the large pulley on the mast and the ends wound in opposite directions and tied to the crank. Another piece of clothesline is tied in a continuous loop around the two smaller pulleys. Install an arrow on the circumference of the window-sill pulley as a visible means of orienting the antenna from inside the house.

A. M. Wettach, Mt. Pleasant, Iowa.

Presetting of Freezer Control Guards Against Power Failure

One food-freezer owner living in the country where electrical power failures occur frequently has devised a procedure for preserving the contents of the freezer when it is temporarily inoperative. He listens for storm warnings over the radio, or TV, and when one is announced turns the temperature control on the unit to the coldest position, leaving it there until the storm has passed. If electrical service is interrupted, the colder air helps to keep the food frozen until power is restored.

John Krill, North Lima, Ohio.

Straight Crosscutting of Hose



Clean crosscutting of rubber hose for washers or when installing fittings can be done easier by plugging the hose with a snug-fitting wooden dowel. The firm support will keep the soft rubber from

sagging out of line from the pressure of the cutting tool. A single-edge razor blade is well suited for this type of cutting job, but must be handled carefully.

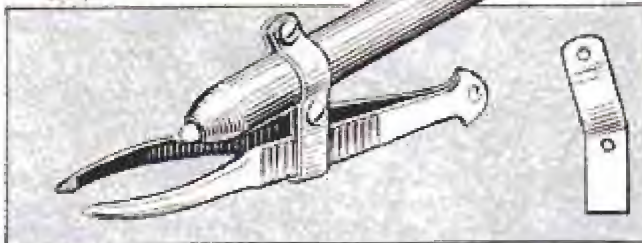
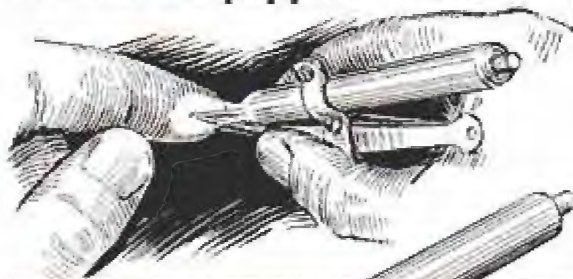
Frank A. Javor, North Bergen, N. J.

Water-Filled Mucilage Bottle Moistens Envelope Flaps

The job of moistening a number of envelope flaps is easier with the use of an old mucilage bottle filled with water. Invert the bottle, press it down on the flap and an even amount of water just the right width will be released. When not in use the applicator seals itself preventing the bottle from leaking if tipped over.

Eleanor Smith, Gainesville, Fla.

Tweezers Equipped With Pen Light



Fine work can be easily illuminated with a single-cell pen light attached to one side of a pair of tweezers by means of a metal bracket. Form and drill the bracket as shown in the illustration so that it fits snugly over one leg of the tweezers and around the flashlight, fastening it in place with small machine screws. Even when not using the tweezers, it can be placed beside the work to provide light.

WTM 58

THIS MINIATURE four-poster makes an unusual magazine rack which will fit in well with colonial furnishings. The four posts and two end stretchers present an excellent opportunity for the owner of a wood-turning lathe to practice turning identical work. Rough stock should be 1½ in. sq. and a few inches longer than the length of the finished piece to allow for a shoulder at each end when turning. Following the half patterns below, begin turning the posts, starting at the square section and working towards each end. After turning, reduce the square section of each post to the finished dimension on a jointer. Round tenons are then turned on the ends of the stretchers to fit into holes centered 5 in. down from the tops of the posts. Form the mortises in the square section of the posts by drilling a series of holes and chiseling out between them. Cut the foot and headboards identically according to the half pattern given below. Rabbet the ends to form



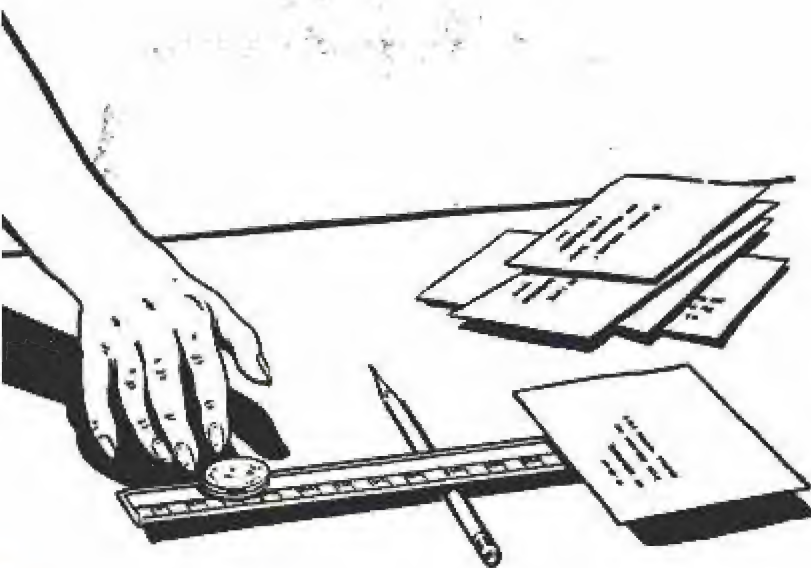
flat tenons to fit the mortises in the posts. Flat tenons also are formed on the ends of the side rails. Before assembling, attach $\frac{3}{4}$ -in.-sq. cleats to the inside of the framing members, flush with the lower edge, to support the plywood bottom which is nailed in place. Glue the rack together and finish it with a clear, dull-gloss varnish.





SHORT CUTS *at Your Desk*

If you have a number of letters to mail, make a handy stamp moistener from an emptied air-deodorizer bottle of the type that has a wick. When the bottle is filled with water, stamps simply are pressed against the saturated wick



Improvise a letter scale from a 12-in. ruler balanced on a pencil. If a letter centered on the 10-in. mark outweighs two half dollars placed on the 2-in. mark, the letter weighs more than an ounce and will require additional postage

You can extend the life of a worn typewriter ribbon by soaking it in hot water. Drop it into a jar of water, seal it and let it stand a few days. Then remove the ribbon and permit it to drain dry before reinstalling it in a typewriter

Prevent ink-stained fingers by attaching a pen wiper directly to the bottle so it always is handy when filling a pen. A piece of soft leather is ideal for this when attached with a rubber band so it can be replaced easily when soiled





If you sometimes feel you need a "third hand" when tying a fancy bow on a specially wrapped gift box, try using a pushpin. As shown above, the pin replaces the usual finger while the bow is being tied

When your desk sometimes is used as a package-wrapping table, install a convenient holder for a ball of twine by nailing a plastic measuring cup to the wall. Run the twine through a hole in the cup handle

Instead of "dog earing" the corners of the pages of a book to mark your place, use bookmarks made by cutting the corners from envelopes. The envelope markers fit neatly over the page corners for quick reference

To assure slipfree knots when tying a package to mail, pull the string through a dampened cellulose sponge to wet it thoroughly. When the saturated string dries it will expand slightly, tightening the knots



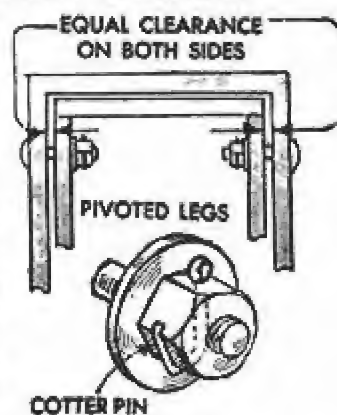
Old Refrigerator-Shell Cover Locks Soft-Drink Cooler



One filling-station operator made a cover for his soft-drink cooler from an old refrigerator shell. It eliminates the need to move the cooler inside at night and yet effectively keeps out prowlers. The cover is slipped over the top and long bolts are pushed through flanges at the bottom and through the wall so that nuts can be attached on the inside.—E. V. Reyner, Townsend, Mont.

Clearance for Leg Assemblies To Pivot Set Without Washers

Where folding legs are assembled in pairs with a cross piece between them, pivoting on bolts is possible without the use of spacers. Run bolts in from the sides of the table through each leg and draw the nuts up on the bolts so that the clearance



space for each leg is equal. Then drill holes through the nuts and bolts and install cotter pins as shown. Be sure to use washers between the legs and nuts.

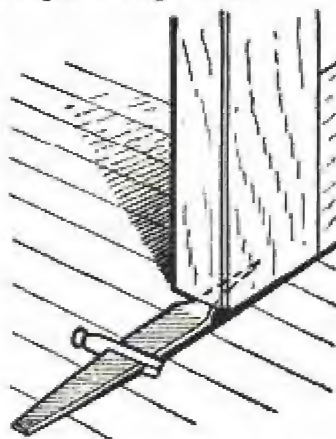
Handy Utility Pail Made From Gallon Paint Can

Removing the sealing rim at the top of a clean 1-gal. paint can will provide a handy utility pail that can be used for mixing solutions, drawing liquids from larger containers or as a giant pail. Trimming off the sealing rim with a regular can opener leaves a rounded edge which permits easier cleaning, and prevents hand cuts caused if the entire top flange is removed. If the paint can has no bail, bend one from coat-hanger wire and fit it in holes punched near the top of the pail.



Foot-Operated Stop Holds Door When Fitting or Repairing Lock

If you have no helper to hold a door while fitting a lock, use a foot-operated "door-stop." The stop consists of a flat file with a round clothespin fitted over its mid-point to provide a fulcrum. The tang of the file is slipped under the door at the outer edge.



Stepping on the opposite end of the file forces the tang up against the bottom of the door, holding it until foot pressure is released. To apply greater leverage against the door bottom, slide the clothespin toward the tang.

☛ To remove candle wax from a cement floor, first scrape off the excess drippings, and then place a clean blotter over the spot and apply a hot iron to it. The heat will melt the remaining wax which will be drawn up into the blotter.

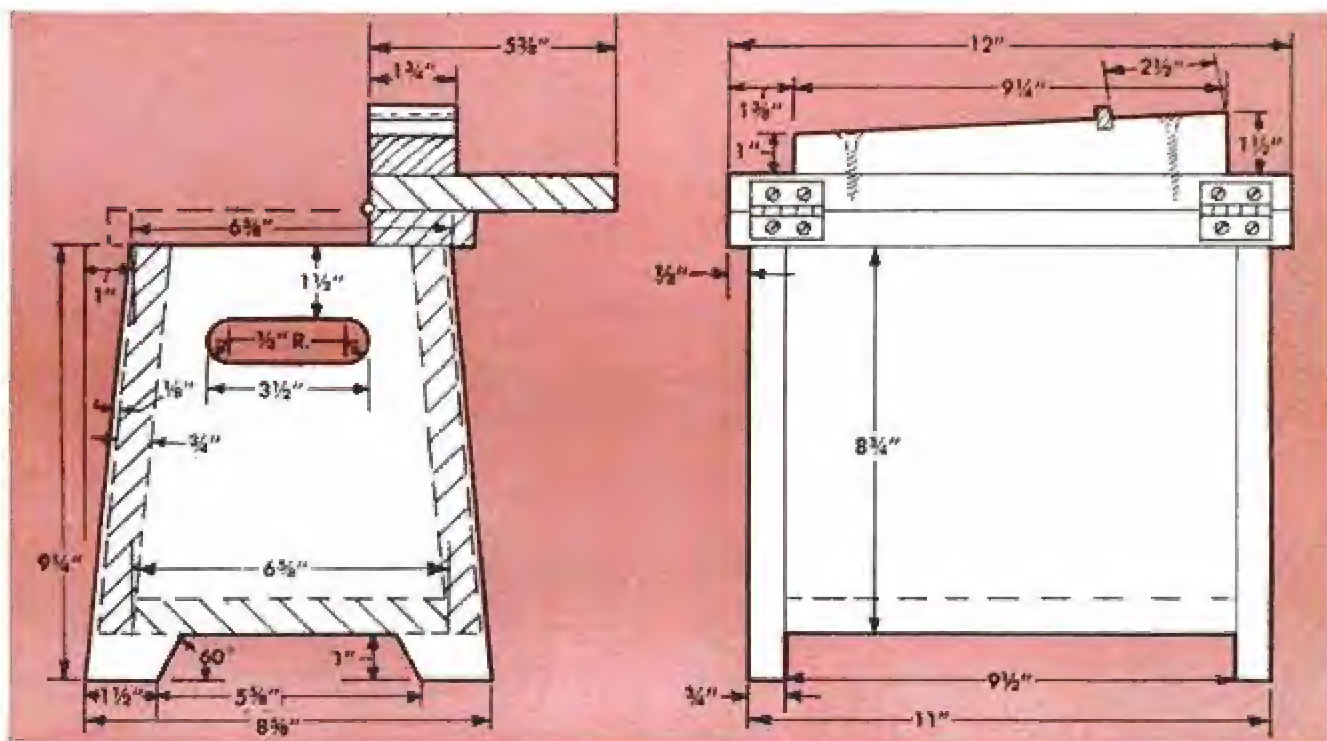
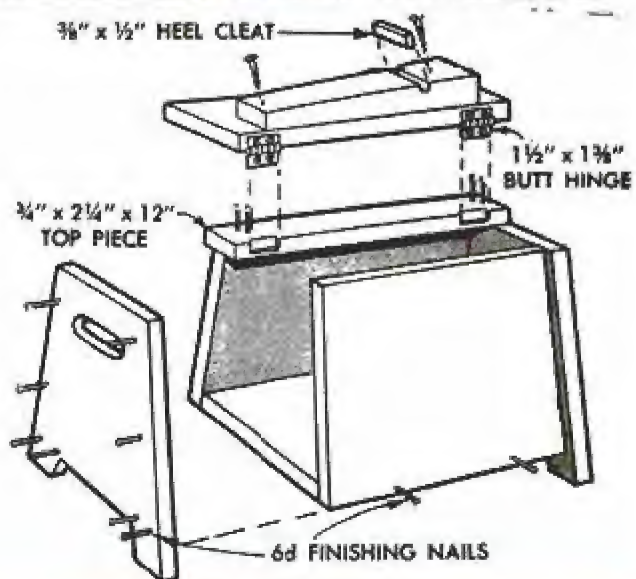
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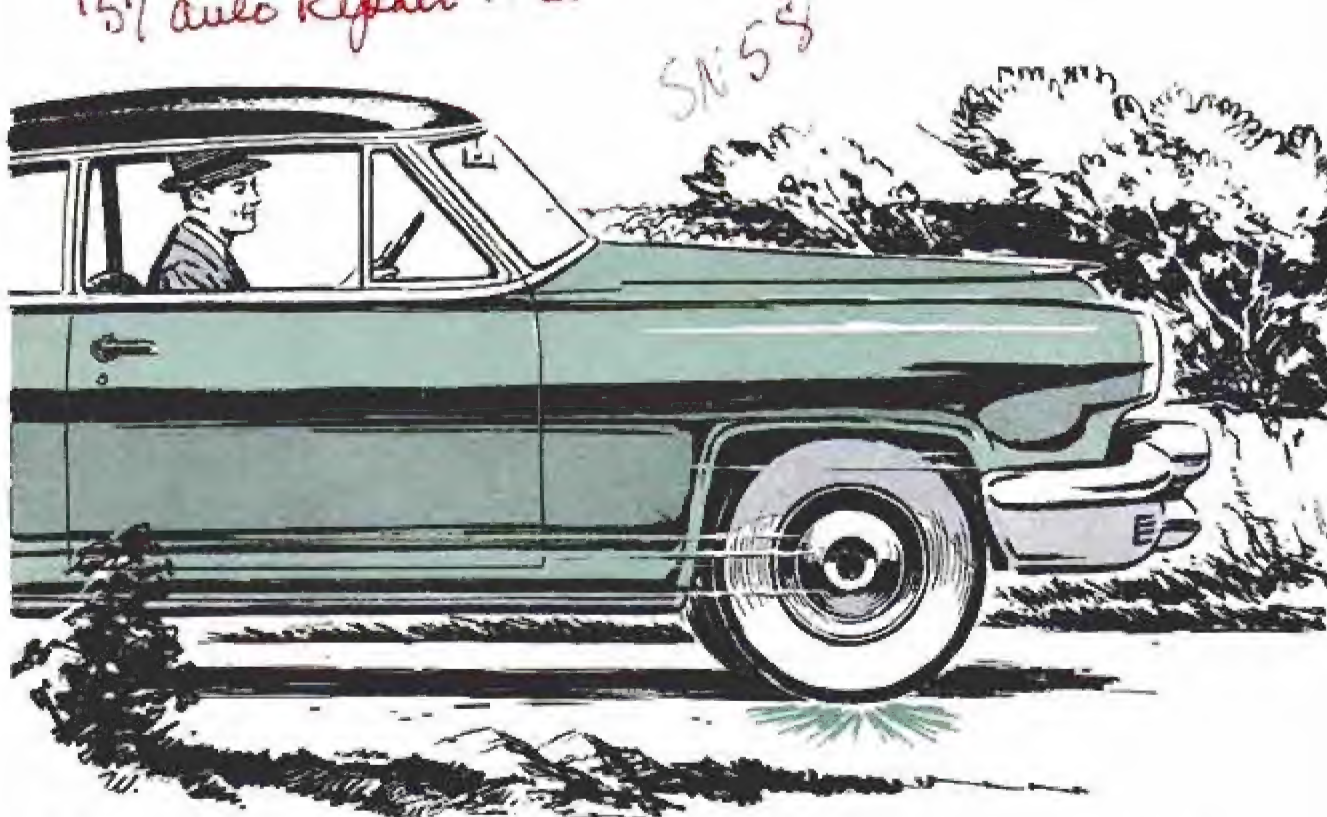
By John Bergen

DOES YOUR HOME have a place for storing shoeshining equipment? If not, you'll want to build this shoeshine box which, when open, has a convenient footrest on top for that quick shine.

Start by making a paper pattern of the end of the box and trace it onto two pieces of $\frac{3}{4}$ -in. stock which are then cut out. To cut the handholds drill 1-in. holes at each end of the proposed openings and saw out the sections between them with a coping saw. Next, cut out the bottom piece beveling the side edges in at the top slightly. Both sides of the box are identical being beveled at the top outside edge and bottom inside edge. Glue the box together, using finishing nails or wood screws for reinforcement. Set the sides in about $\frac{1}{8}$ in. from the edges of the end pieces and fit the bottom flush with the top of the opening between the feet as indicated.

Small butt hinges fasten the lid to a narrow top piece which is attached to the box so that it overhangs the ends and side. A footrest is fastened to the inside surface of the lid flush with the hinged joint. Cut the footrest from a piece of 2 x 4, tapering it down to a thickness of 1 in. at one end. A slot $\frac{3}{8}$ in. wide by $\frac{1}{4}$ in. deep is cut across the tapered surface $2\frac{1}{2}$ in. from the high end to receive a wooden cleat against which the heel of the shoe rests. Paint your shoeshine box inside and out or finish with stain and varnish.





The Causes and Cures of TIRE "THUMP"

By Ed Packer

BECAUSE MODERN CARS run so smoothly and silently, minor sounds and vibrations that went unnoticed in older-model cars are quickly apparent to a motorist today. Generally an unbalanced or out-of-round tire is the first thing blamed for an unusual sound or feeling in a car, although other components of the body, chassis and running gear can produce effects that are identical to tire "thump."

A fairly accurate test that will determine whether the thump is in a tire or some other unit is to inflate all four tires to 50

lb., then choose a smooth stretch of highway and drive at your usual speed. If the thump disappears, it is quite certain that it is caused by a tire. Next, deflate one tire to normal pressure and drive again. If a thump is not apparent, reinflate that tire to 50 lb. and deflate one of the others. Repeat this operation until a tire causes a definite thump at normal pressure. That will be the one causing the trouble. In some cases, when using the "50-lb. test," no thump will be noticed, and when the tires are deflated to normal pressure the

Tires are balanced on cars by this machine that rotates wheel by means of electric-powered roller

Tire out-of-roundness should not exceed .080 in. and no more than .050 in. in 10-in. length of tread



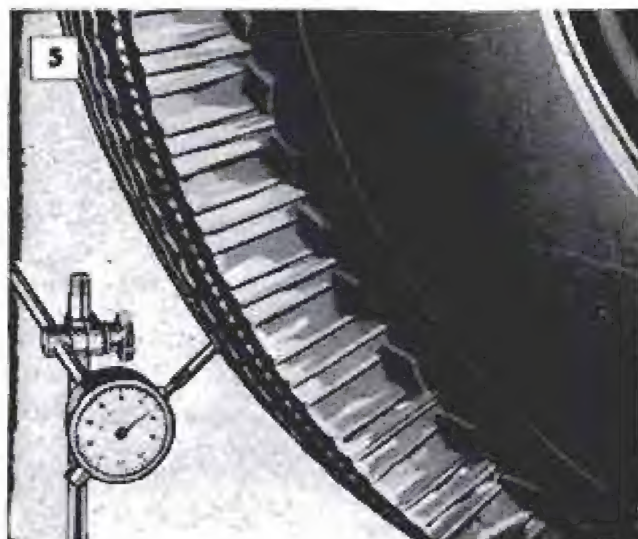
original thump will have disappeared. This phenomenon occurs because overinflation forces the beads of the tires to seat properly on the flanges of the wheel rim, Fig. 8, and the tires then run true.

If a tire is not too badly out of balance it sometimes can be balanced while on the car by a special machine that rotates the wheel by means of a roller driven by an electric motor, Fig. 1. A pointer clamped to the bumper will oscillate in direct proportion to the degree of unbalance as the car is vibrated by the rotating wheel. Lead balance weights are added to the wheel rim until the pointer oscillations are within acceptable limits.

In cases where a thump is extremely severe, a mechanic will check tire out-of-roundness and lateral runout with a dial indicator as shown in Figs. 5 and 6. A soap-and-water solution is painted on the rubber to permit the indicator to slide freely. No tire should be out-of-round more than .080 in., and no more than .050-in. distortion should occur in any 10-in. length of tread. Lateral runout or "wobble" should not exceed .0625 or about $\frac{1}{16}$ in. If runout is .080 in. or more, Fig. 2, remove the tire and check the wheel. Should the wheel also be out-of-round a similar amount, mount the tire with the high side opposite the high side of the rim. However, if the wheel is true, then the tire will have to be buffed to roundness on a machine that removes rubber from the high spot on the tread. Although some tread is removed, the life of the tire is extended since it will not bounce and scuff as it did before. In either of the last two cases, final balancing of the tire-and-wheel assembly is done on a machine of the type shown in Fig. 4.

Should a tire show extreme lateral runout, it is quite possible that the wheel has been bent. Since the tire is flexible, it will follow the distortion of the rim and also

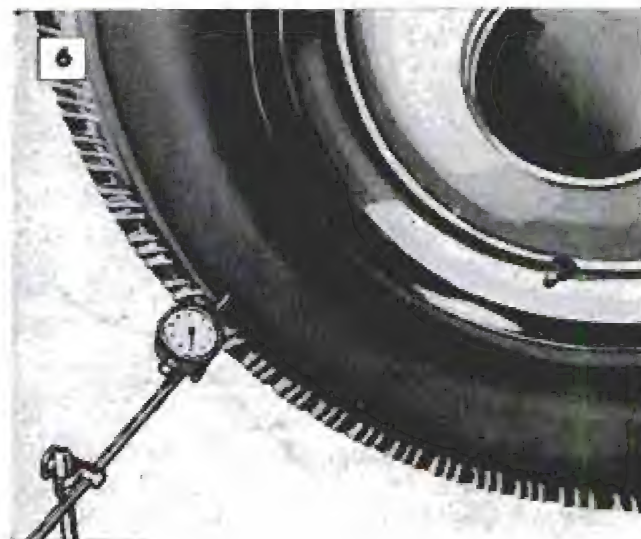
Accurate measurement of tire out-of-roundness is made by using dial indicator bearing against tread

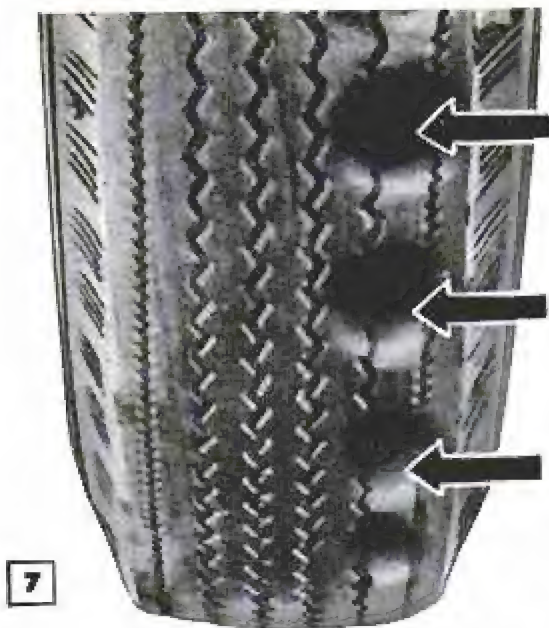


Wheels can be straightened without removing tire by using this machine employing hydraulic pressure



Above, familiar wheel-balancing machine balances wheel-and-tire assembly when removed from car. Below, lateral runout is checked by using dial indicator contacting sidewall lubricated with soap and water





7

One cause of thump is "cupping" of the front tires, which usually is a result of wheel misalignment

appear to be out of alignment. Wheels can be straightened without removing the tires, by using a machine of the type shown in Fig. 3. If a rim has dents, the tire should be removed and the dents hammered out before the rim is straightened, since a damaged rim will not permit a tire to seat properly. The latter is especially true when tubeless tires are used.

A preventive measure against thumping is a visual inspection of the tires on your car. If the front treads show small areas of "cupping" as in Fig. 7, rotate the tires as indicated in Fig. 10. The front tires then will be used at the rear where the strain of acceleration will smooth off the cupped areas. Cupping of the front tires generally indicates misalignment in the front suspension system. Camber, caster and toe-in should be set on a wheel-alignment machine.

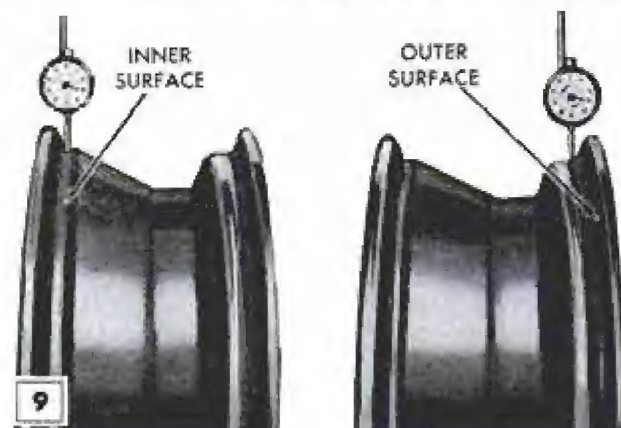
When a thumping sound or feeling persists in a car, even when all the tires have been inflated to 50-lb. pressure, some mechanical component is at fault. A thorough grease job sometimes is all that is required to eliminate a thump. "Frozen" kingpins or bushings in the front-wheel suspension will produce a feeling, and sometimes a sound, similar to tire thumping. Because the steering is connected to the front wheels through linkage, unusual sounds originating in the front suspension are felt directly through the steering wheel.

Front-wheel shimmy and tire thump are often traceable to shock absorbers that are inoperative, out of adjustment, or require fluid. Bad shock absorbers allow rear wheels to bounce over small bumps and spin while in the air, causing the rubber to scuff off the tire treads when they again contact the ground. ★ ★ ★



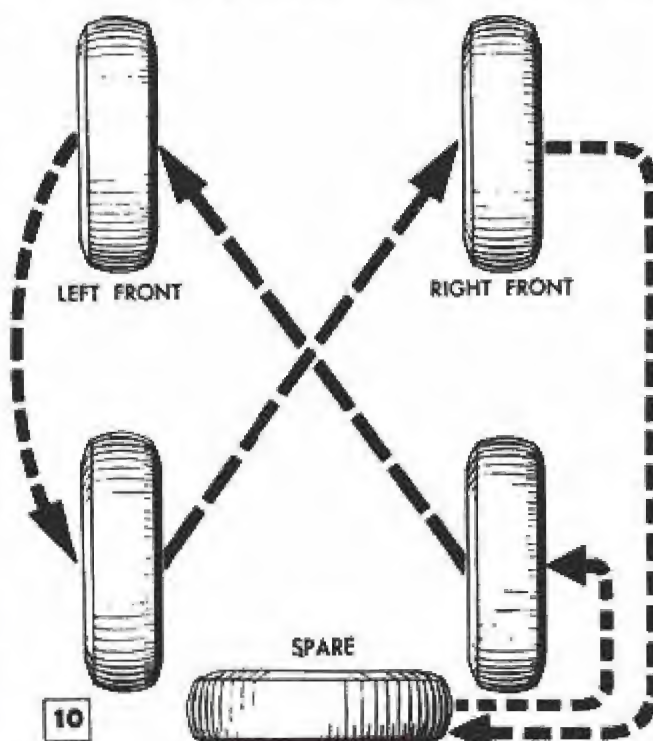
8

Above, overinflating will force bead to seat properly on wheel rim. Tire then is deflated to normal



9

Above, since wheels as well as tires can be out of round, they also should be checked with dial indicator when severe thumping is noticed. Below, switching tires as indicated promotes longer wear, helps to avoid wearing conditions that lead to thumping



10

Home-Grown Fruits and Vegetables Washed on Window Screen

After gathering fresh fruits and vegetables from your garden, spread them out on a window screen and wash them with a hose. The screen should be propped up slightly on one side so the produce will not rest in the mud that is washed off. Before bringing the produce into the house let the water drain off.—Mrs. Michael Fey, New York City.

Worn spots on a waxed floor should be patched with liquid wax to prolong the life of the overall wax application. The liquid preparation cleans as it waxes so preliminary washing is not necessary.



Wetting Agent Improves Rubber-Stamp Imprint



Rubber stamps will produce more legible imprints if the letters and numerals are first cleaned with a photographic-wetting agent. The treatment prepares the smooth

rubber surfaces so that ink is readily accepted. A heavy solution of washing detergent produces similar results.

Ken Murray, Colon, Mich.

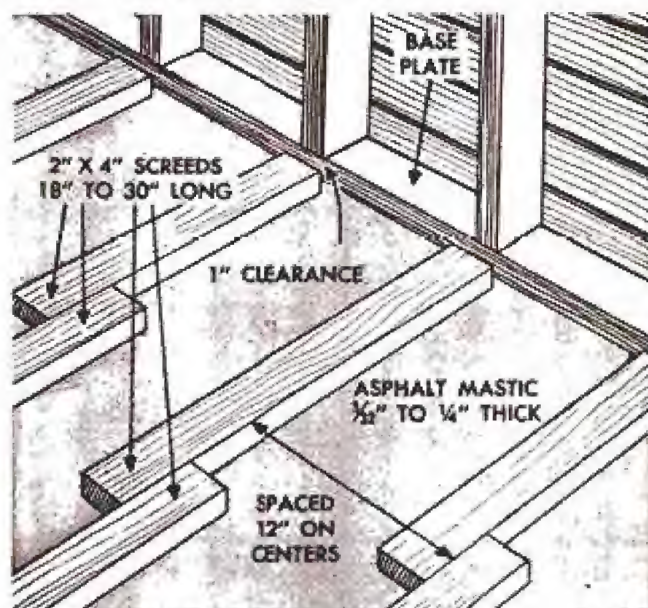
Finger Ring Size Marked on Cork To Aid in Purchasing Gift Ring

Next time you wish to make a surprise gift of a ring, ask to see one that the individual wears and slip it over a tapered cork. Insert a pin, or impress the cork with your fingernail, at the point where the ring binds. As soon as possible, accent the mark by drawing around the cork with a pen or pencil.



Finished Flooring Installed Over Concrete Without Subfloor

By nailing to short pieces of 2 x 4s called screeds, finished flooring may be laid over a concrete floor thus eliminating the need to first install a subfloor. Screeds from 18 to 30 in. are specified in FHA requirements, and should be arranged in staggered parallel rows 12 in. center-to-center with an overlap of not less than 4 in. Treat the screeds with an odorless wood preservative that will not bleed through the flooring before placing them on the concrete. An asphalt mastic applied hot to one side of the screeds is used to fasten them to the concrete. Spread the mastic with a notched trowel of the type used for linoleum cement to prevent too heavy an application. A space of at least 1 in. should be left between the screeds and the base plate of the walls to permit expansion.



STAPLE SAVVY



When packing lunches in paper bags, you can make sure there will be no accidental spilling of the contents by folding over the top of the bag and stapling it shut. A double fold of the bag top is stronger

Staples can aid lady in distress and save her from embarrassing situation. Staple repair will hold securely until broken strap can be mended or replaced



Handy home file can be made by stapling several business envelopes together at lower edges. Use envelope flaps as index markers by cutting each one slightly shorter than the one behind it, as indicated below





Seed packets used to identify garden plantings will not blow away if slipped over the stakes used to locate the rows and stapled in place. Reinforce the packet with cellulose tape where it is stapled

Installing shelf paper and edging is a lot simpler and quicker when staples are used to hold them in place. Paper liners for drawers also are more quickly fitted when staples are used to fasten them down



Staples are ideal for fastening felt weather stripping to door and window frames, as they are small enough so that they do not interfere with the sealing action of felt, yet hold it securely in place

For repairing screens, replacing screen wire in an old frame, or attaching new screen wire to a frame you have built yourself, staples will help you do the job more neatly and in considerably less time



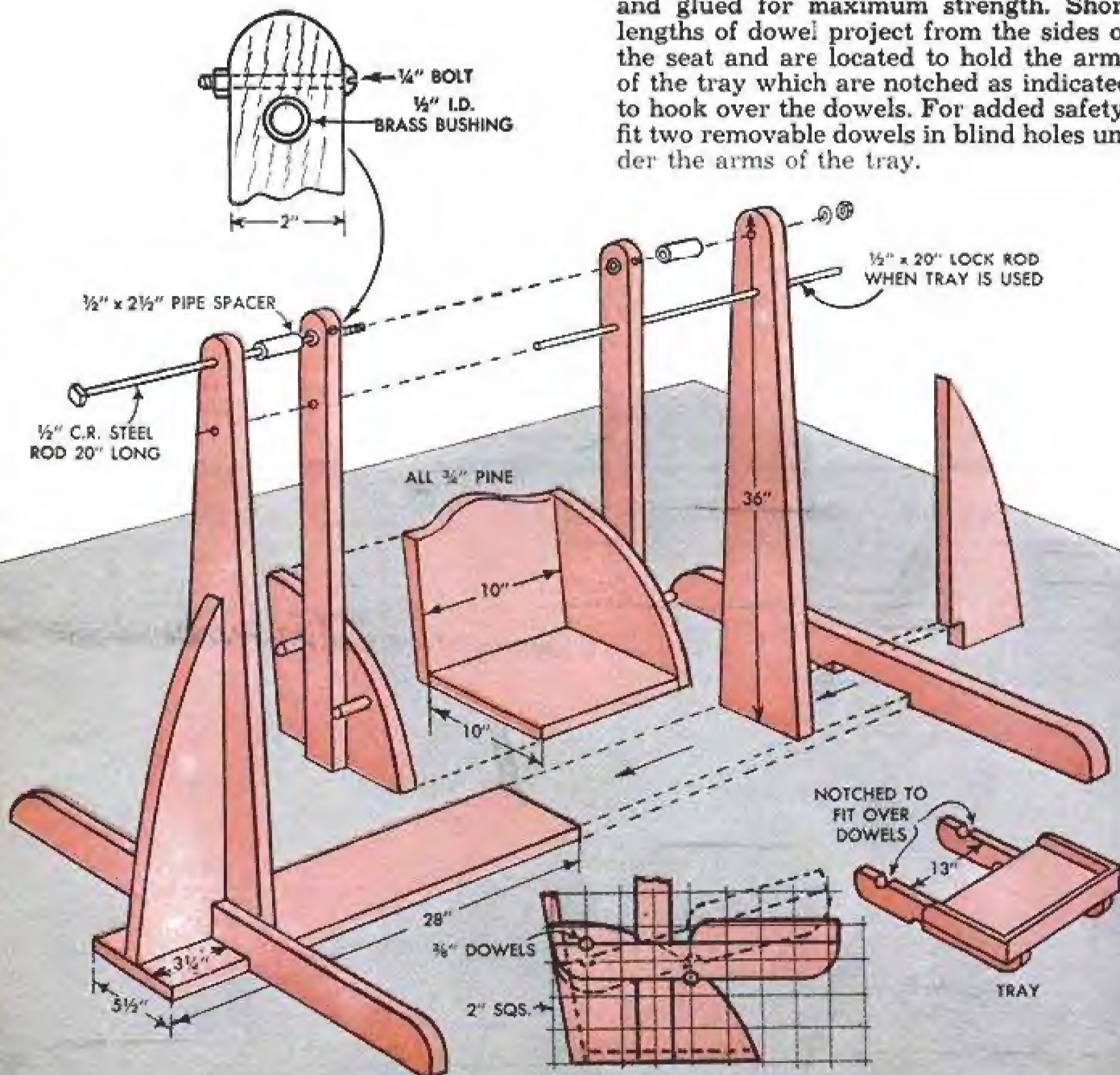
WTM 50

Baby Swing With Tray



Removable tray on swing is convenient play surface, or baby's food can be served on it at mealtime

LIGHTWEIGHT, yet sturdy and practically tipproof because of its wide base, this baby swing can be carried from one room to another and will stand abuse from even the most lively infant. At mealtime the swing is held stationary by a locking bar, and the tray which ordinarily keeps baby safely in the bucket seat becomes a table. Material for the swing can be $\frac{3}{4}$ -in. solid stock or plywood. The swing uprights are 36 in. high and 6 in. wide at the bottom, tapering to 2½ in. at the top. Swing supports are about 26 in. long and 2 in. wide. Height of the seat above the floor is determined by the size of the baby. A rod 20 in. long provides a pivot for the swing. It is fixed solidly in the uprights of the swing stand and runs through brass bushings in the swing supports. Pipe spacers 2½ in. long keep the swing supports centered between the uprights. All joints are screwed and glued for maximum strength. Short lengths of dowel project from the sides of the seat and are located to hold the arms of the tray which are notched as indicated to hook over the dowels. For added safety, fit two removable dowels in blind holes under the arms of the tray.



Farm Swing Features "Constant Level" Seats

Lengths of pipe and two seats salvaged from discarded implements were used by one farmer to make this unusual swing for his youngsters. The vertical pipes pass through slots cut in the horizontal one which supports the seats. Bolts fitted through this horizontal pipe provide pivots for the vertical pipes, which are pivoted in a similar manner to an overhead length of pipe in the swing frame. This type of assembly permits the seats and lower horizontal bar to remain level throughout the full arc of the swing travel.

C. F. Marley, Nokomis, Ill.

☛ Surface scratches on pewter can be "erased" or made less noticeable by rubbing the area lightly with No. 0 steel wool.



Broom Clips Hold Rolling Pin



A rolling pin can be stored on perforated hardboard, together with the other small kitchen utensils, by snapping it into a pair of broom clips screwed to the board. Drive the screws into scraps of wood on the back side.

Banana Oil Cleans Stiff Brush

Salvage paint-hardened brushes by soaking them in banana oil and rinsing with turpentine. The banana oil loosens the paint, and the turpentine cleans out both the oil and the paint. As

with all solvents, work only out-of-doors or in a well-ventilated room away from heat and flames.



Mildew and How to Combat It in the Home

If you are troubled with mildew in and around your home, the following information will aid in combating this problem. Mildew is a fungus-type growth that germinates from small microscopic spores which grow readily on food, furniture, clothing and other material that has become damp. It thrives on insulation in electronic equipment and clouds lenses in cameras and telescopes. The most harmful effects of mildew are its ability to stain and

rot cloth, decay wood and spoil food. Mildew requires organic food to exist, its appetite running in a wide range from paints to persimmons. Preferring moisture and warmth, mildew grows most rapidly during summer but actually lives all year long. Since it is impractical to wipe or spray every item subjected to mildew with a fungicide chemical, porous bags of dry chemicals which vaporize to protect against mildew can now be purchased for use around the home. If used according to directions, the chemicals are not dangerous. Rooms that smell musty from mildew should be aired out and all furnishings taken outside for airing and drying. Precautionary procedure to prevent mildew contamination of clothing requires frequent washing and dry cleaning.

Information courtesy of John Clarke & Co., New York City.

Tired of Paint. Wallpaper?

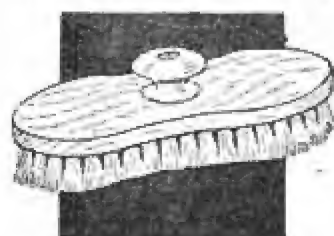
Decorate your walls with beautiful hardwood plywood. It adds warmth and charm like nothing else can. A three-part feature beginning next month shows in full color what a lift wood paneling will give to every room of your house

Aligned Marks Identify Loaded Developing Tank



As a precaution against opening a loaded developing tank by mistake, scribe or paint a continuous line on the cover and container when the tank is closed. Then, when the two marks are in alignment they will indicate that the tank is loaded with film.

Knob Aids in Holding Scrub Brush



A drawer knob fastened to the back of a scrub brush will keep it from slipping out of your hand when wet with soap and water. Drill a hole

through the center of the knob and run a wood screw down into the back of the brush.—Mrs. Harvey Muller, Danboro, Pa.

Drawing Pen Easily Cleaned On Mohair Furniture Glide

This large mohair furniture glide is a better means of keeping a drawing pen free of lint than a cloth. It is also used to start the flow of ink in the pen.



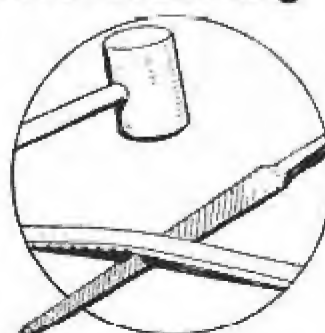
Comb Clears Brush of Loose Bristles



Even the best new paintbrushes have some loose bristles which should be removed before using the brush to avoid ruining a paint job. A good way to do this is to gently run a comb through the bristles.

Balsa Wood Indented for Bending

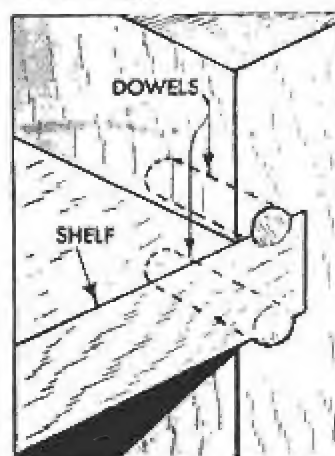
Smooth bending of balsa wood around a specified radius, often required in model building, is accomplished by first indenting the wood on the side having the smallest radius. Indentations



are formed by placing a triangular file under the wood and tapping with a mallet as shown in the illustration. Uniform spacing of the indentations is essential for smooth bending. Distance between the indentations is governed by the radius in that a smaller radius requires closer spacing than a larger one.

Dowels "Lock" Dado Joint

To "lock" shelf ends into dados cut in the side members of a cabinet, drive dowels into holes drilled in the joint as indicated. The holes are centered on the line between the upper and lower surfaces of the shelf and the sides of the dado. It is impossible for the shelf to pull out of the dado until the dowels have been removed.

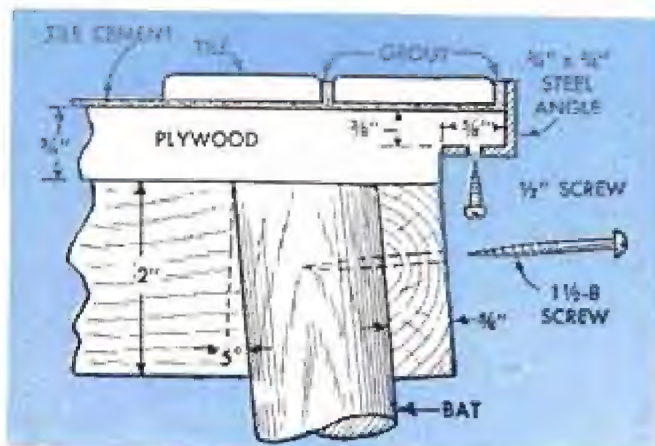


L. H. Weber, Havana, Ill.



TILED-TOP TABLE HAS BALL-BAT LEGS

GRACEFUL LEGS for this table are purchased ready-made as junior-size baseball bats, and ceramic tile is applied to the top with mastic-type adhesive. Size of the original table top was $12\frac{1}{2} \times 18\frac{1}{2}$ in., but the dimensions will vary, depending on the tile pattern. The bat legs are about 21 in. long. The top is cut from $\frac{3}{4}$ -in. plywood and is $\frac{1}{8}$ in. larger all around than the size of the tiles used. Rabbet the lower edges of the top $\frac{3}{8} \times \frac{5}{8}$ in. to accommodate lengths of $\frac{3}{4} \times \frac{3}{4}$ -in. steel angle which are screwed to the underside as shown in the upper right-hand photo. The apron, cut from strips of $\frac{5}{8} \times 2$ -in. hardwood, is beveled along the top edges at an angle of about 85 deg. so that when the legs are attached to it they will have a spread of about 5 deg. from vertical.



Above, steel angles that protect edges of ceramic tile are screwed to rabbet on underside of table top



Above, bat legs are installed with trademark inside. Below, tile adhesive is spread with tooth-edged trowel



Below, after adhesive has dried for 12 hours, grout is wiped into joints and between tiles and angles





How to Build a Better Clothesline

By William B. Eagen

ANY HOUSEWIFE would appreciate a clothesline of this type on which to hang her wash. Turnbuckles at the ends of each line permit easy adjustment when necessary, while the sturdy, well-anchored posts prevent the lines from sagging. When strung with galvanized steel or aluminum wire, clothesline props and the hard work of fastening and removing a cotton line each washday are a thing of the past.

Location Is Important

First, choose a location where the clothesline will be exposed to sunlight at least during the morning hours and, if possible, away from bare ground or other sources of wind-blown dirt. Also, it should be behind the house or other building, out of view from the front of the house. When it is not possible to conceal the clothesline in this way, its appearance can be improved by adding latticework to the end posts or planting shrubs on the side exposed to the street. In addition, the location should have good drainage so that the ground remains firm during the wet months.

Next, determine the amount of line space needed for your average size of wash and stake out positions for the posts. A clothesline that is 25 ft. long requires only one post at each end, while one that is 50 ft. or more should have a center post for additional support. No more than 4 lines should

be strung between single posts. If more lines are needed, use two posts at each end, or erect a second clothesline.

For posts, use cedar, redwood or locust 4 x 4s or larger in 8½-ft. lengths and 4 x 4s of the same material for crossarms. The latter should not exceed 5 ft. in length for single-post installations, 10 ft. when two posts are used at each end of the clothesline. Bolt the crossarm in a ¾-in. dado on the side of the post away from the lines so that the crossarm is pulled against the post.

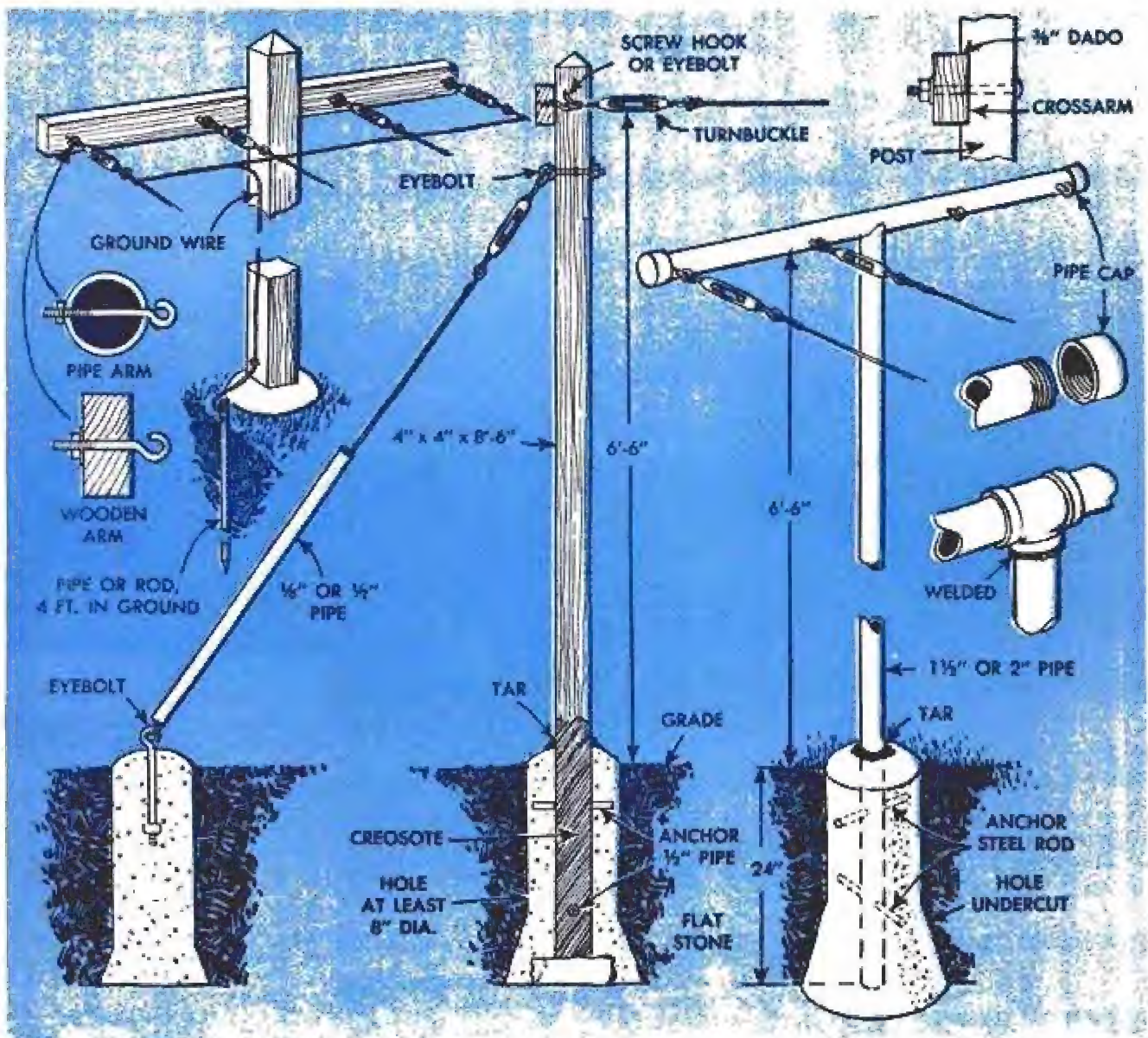
For a completely metal clothesline, use 1½ to 2-in. galvanized-steel pipe for posts and crossarms. The crossarm is welded directly to the top of the post, or slipped on a tee that has been turned on the top of the post. In the latter case it is necessary to drill a hole through the tee and the crossarm and through the tee and post to prevent them from turning or slipping. Or, the tee can be welded to the crossarm and post as shown in the drawing. Pipe caps are turned on open ends of the crossarm for safety and to prevent rain from entering the pipe and rusting it.

Posts Anchored in Concrete

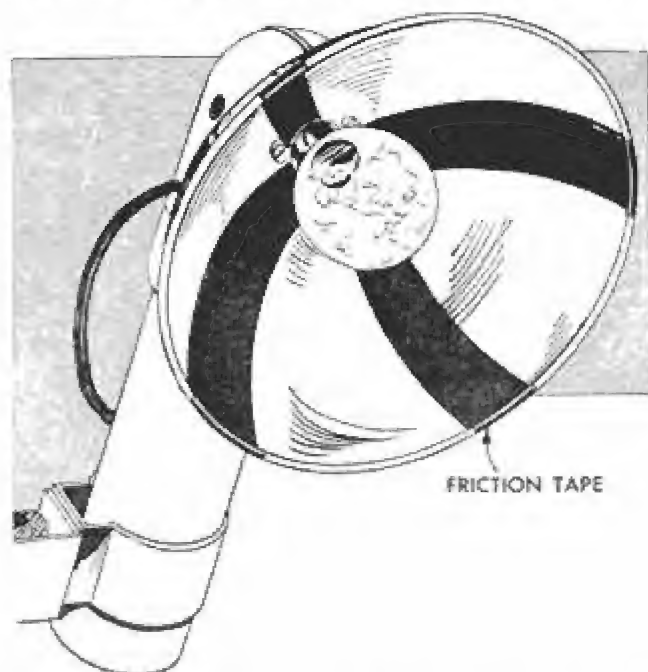
Holes for the posts are dug not less than 2 ft. deep and 8 to 10 in. in dia. The sides at the bottom of each hole are undercut as shown in the drawing, to allow concrete to form an anchor around the post.

Before placing the posts in the ground, whether wood or steel, drill holes in the crossarms for the eyebolts needed to fasten the turnbuckles and lines. Space the holes at least 18 in. apart to allow ample clearance between lines. Also, drill two holes in the underground section of each post for the anchor rods or pipes as shown in the drawing. Then, place the posts in the holes and pour enough concrete in each so that the top can be rounded off about 2 in. above the ground. The underground part of wooden posts must be soaked in creosote or other preservative to prevent rot before they are set in the concrete. When the concrete has hardened, seal the joint between it and the post with tar and paint the above-ground part of the post with a good outdoor paint.

To prevent the posts from being drawn toward each other at the top, guy wires are fastened on the end posts as shown in the drawing. When metal lines are used with wooden posts, a ground wire should be run from each line to a rod in the ground for protection against lightning. ★ ★ ★



Black Tape on Flash Reflector Reduces Light Intensity



To prevent overexposure when using a photoflash for close-ups, reduce the reflector area with strips of black friction tape. It is best to take several test shots, using different quantities of tape, to determine the resulting flash qualities. When full intensity of flash is required, store the tape on the case for later use.

Eugene Lee Burner, Morgantown, W. Va.

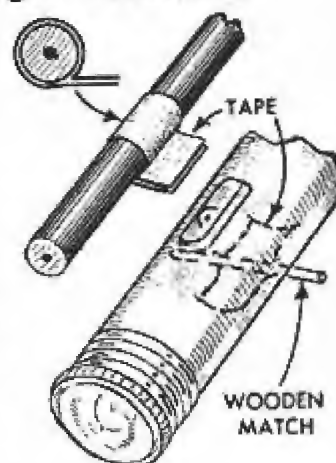
Old Trunk Converted Into Kennel

An excellent portable kennel can be made from an old steamer trunk as shown in the photo. First cut an opening on one side and fold strips of tin over the exposed edges, nailing them in place. If the exterior surface of the trunk is steel, drill holes through it and use sheet-metal screws instead of nails. The door is cut from $\frac{3}{8}$ -in. plywood, and fitted with a knob at the outside leading edge. Rails and stop strip are made by channeling square stock with a rabbet plane. These pieces can also be fabricated by nailing a $\frac{1}{2}$ -in. strip on the outside of a narrower cleat. Vents $1\frac{1}{2}$ in. wide are cut crosswise in the lid and may be also cut on the sides. For added warmth, cover the interior with $\frac{3}{4}$ -in. insulation board.—Laurence M. Bourne, Vancouver, B. C., Can.



Rolling of Flashlight Restricted

A flashlight or other cylindrical object can be prevented from rolling off a surface which is not perfectly level by taping a matchstick to the side as shown. If a matchstick is not available, a paper clip may be used. To keep a pencil or other small-diameter item from rolling wrap a strip of tape around it with the ends joined together to form a projecting ear.



Nail Hardwood Floor Over Old Softwood Floor

New hardwood flooring can be nailed on top of an old softwood floor if the latter is nailed tight to the subflooring and badly worn areas are replaced preparatory to installing the new floor. The new material should be laid at right angles to the boards in the old flooring to minimize uneven areas. Use shims where necessary.

Clothespin Fitted on Bucket Bail Provides Comfortable Handgrip

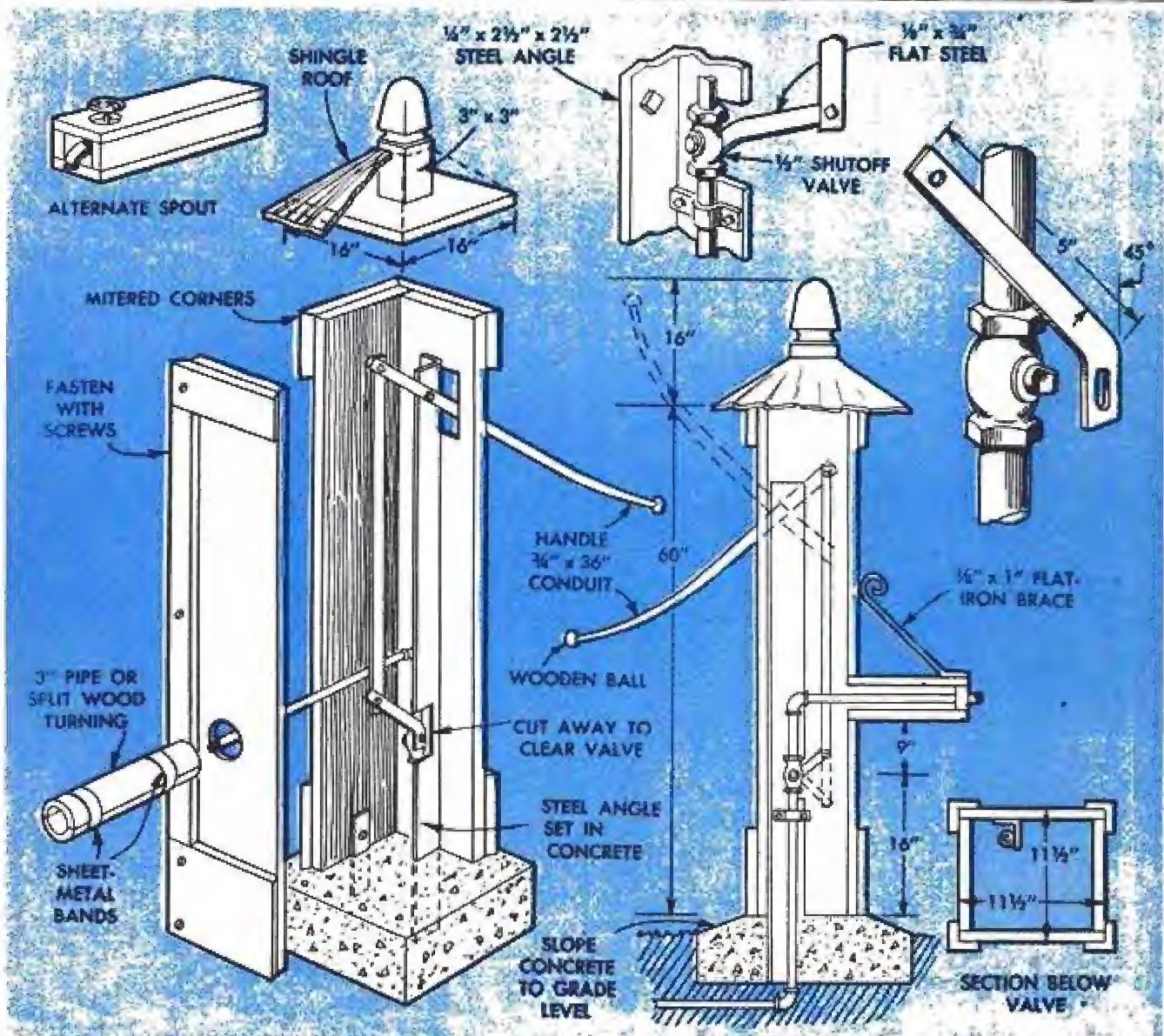
To avoid the discomfort of carrying a heavy pail or other container by means of a wire bail, slip a clothespin over the bail as indicated. Keep a clothespin handy in your car or pocket for this purpose when shopping. Store clerks also will appreciate the comfortable grip so provided when they must get heavy containers from a stockroom.



WEATHERED PUMP

Hides Lawn Hydrant

ADD RUSTIC APPEAL to your yard with this weathered pump that actually supplies water through a pipeline concealed inside. To add to the realism, the pump handle can be made to operate a shut-off valve of the type indicated in the detail. An alternate method of controlling the water is shown in the upper left-hand corner of the detail. Here a standard globe valve is located in the pump spout so that the handle projects through the top. The pump is mounted on a poured-concrete base about 18 in. square which is poured around the water line. A heavy steel angle is embedded in the concrete alongside the pipe to support it and one side of the pump. Steel flats are embedded in the concrete to which the other sides of the pump are bolted. The pump spout can be a length of 3-in. pipe or a split wood turning clamped with sheet-metal bands. Do not stain or paint the pump, simply let the wood weather.





Camera Vibration Dampener

To prevent blurred photos, caused by jarring the camera when tripping the shutter, wire a small weight to the front edge of the camera bed as shown. The jarring especially affects photos taken at slow shutter speeds with a camera racked out for close-ups. A 1 or 2-oz. darkroom-scale weight usually is heavy enough.



Reinforced Sandpaper Strips Substituted for Emery Cloth

Where abrasive strips must be pulled back and forth to smooth round work or scrollsawed edges, and emery cloth is not at hand, sandpaper cut in strips may be used. Reinforcing the backs of the strips with masking tape prevents the sandpaper from tearing easily and adds extra strength. When thus reinforced, sandpaper can withstand considerably more flexing than normally possible.

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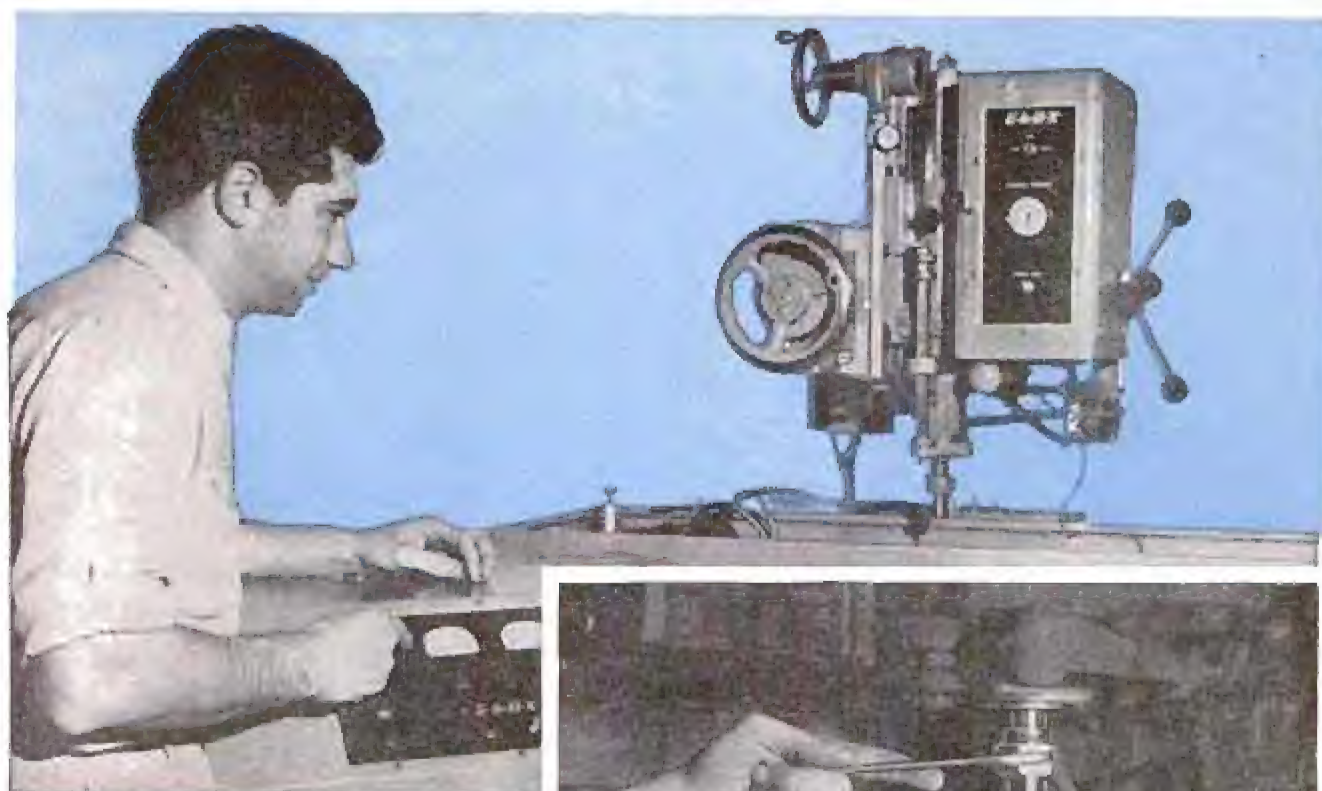
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ELECTRIC SPARKS CUT HARD METALS

By Chas. G. Griffith

ELECTRIC SPARKS are the cutting edges of new tools used to machine hard metals. In electrical-discharge machining, or spark machining, as the process is sometimes called, metal is removed by controlled electrical discharges across a dielectric gap. The process is used for regular shop jobs such as drilling, reaming, broaching, diesinking and grinding, and also certain other types of work in exceptionally hard alloys which are impractical to carry out with conventional equipment.

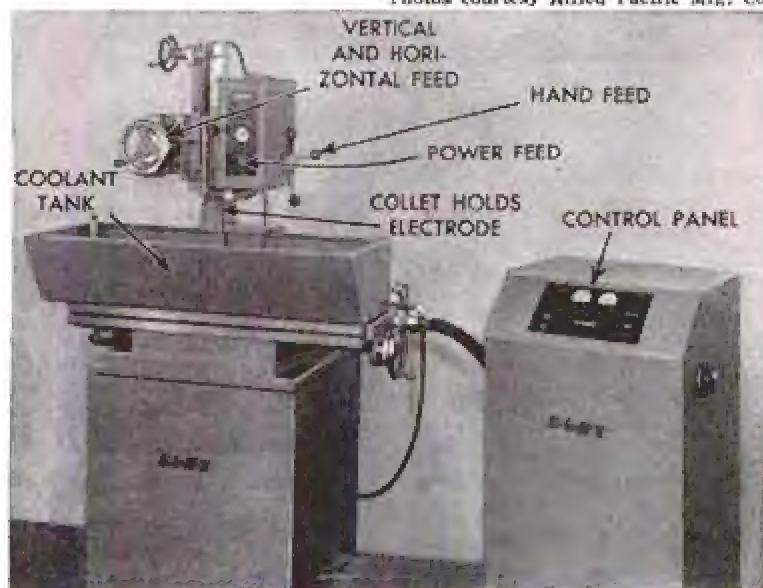
A typical setup is shown diagrammatically on the following pages, the cutting tool being the negative electrode and the work forming the positive electrode. A typical machine of the type commonly used is pictured above and in the photos at the right. The

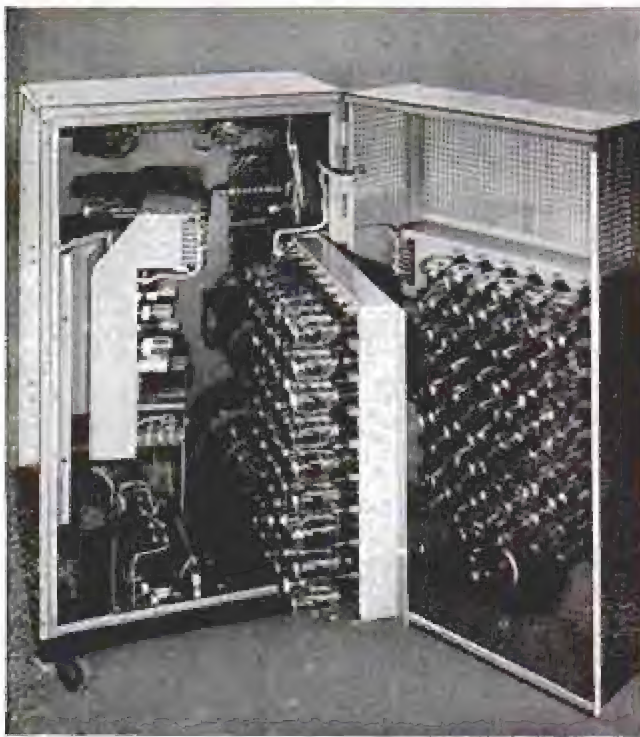


Above, in appearance the spark-machining unit is very similar to a small vertical milling machine. In the inset a fairly large electrode (cutting tool) is being attached to the spindle

Typical unit has both manual and automatic feeds, the latter electrically controlled to maintain a constant gap between the tool (electrode) and the work. Note separate control unit

Photos courtesy Allied Pacific Mfg. Co.

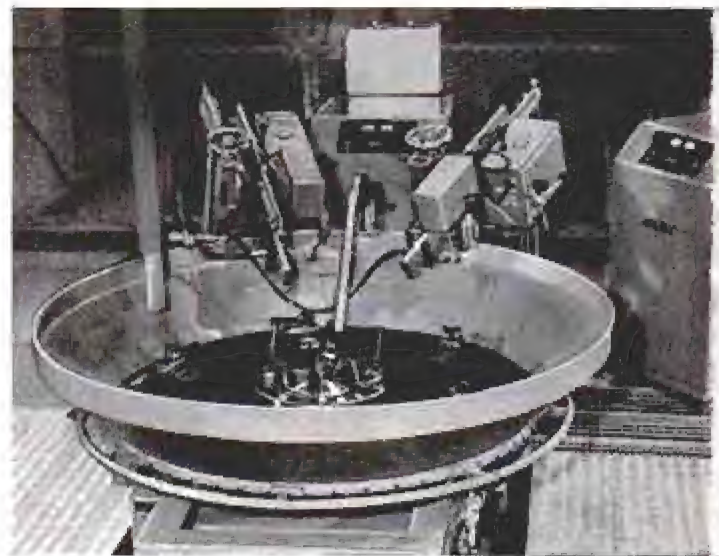




Photos by Elox Corp.

Control unit open to show banks of power tubes and condensers which build up electrical discharges

discharges occur in a dielectric coolant which is forced through the tubular cutting tool under pressure. As sparks do the actual cutting the use of a tool is simply to establish an area of the required size in which the sparks will be discharged. Although heat of the arc at the instant of discharge can reach 20,000 deg. F., or even more, the metal being cut is not heated. For this reason the process does not affect

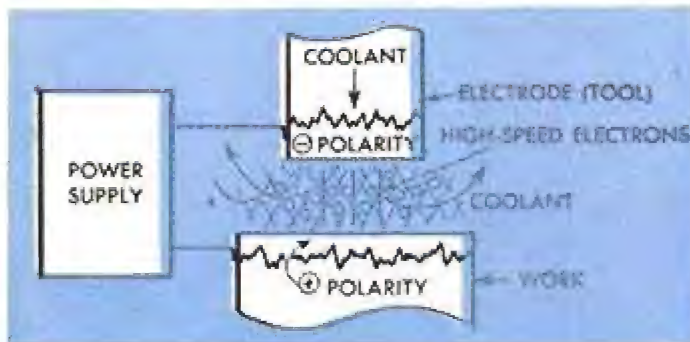


Here is a machine of a different type especially designed for precision machining of jet-engine parts

either heat-treated or work-hardened metals. No heat is generated in the tool itself.

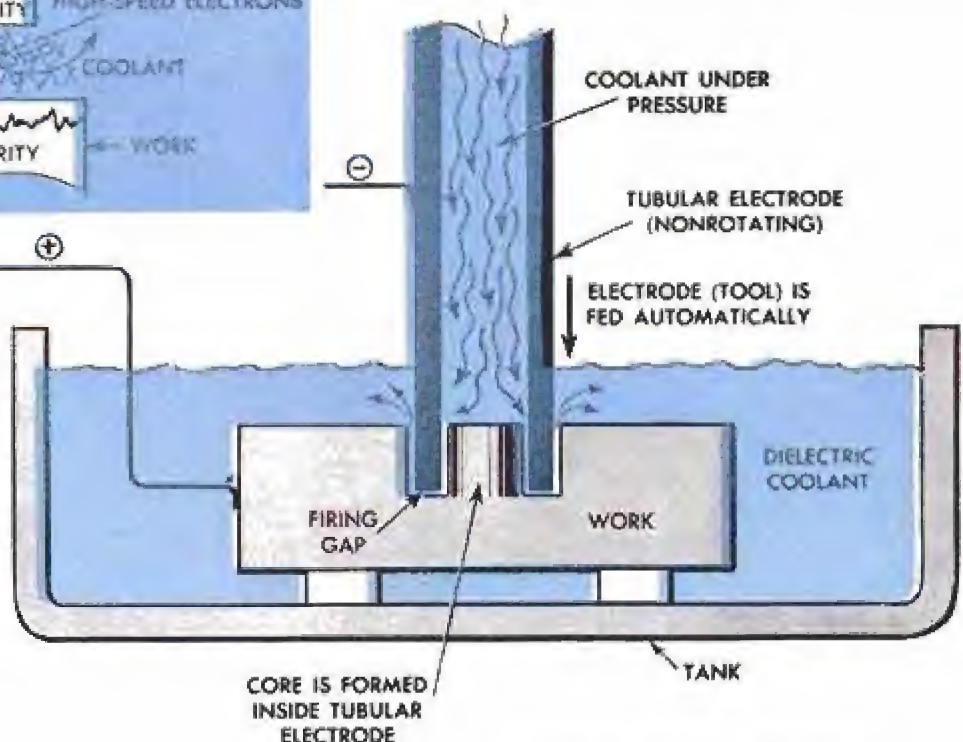
Constant Boring Rate

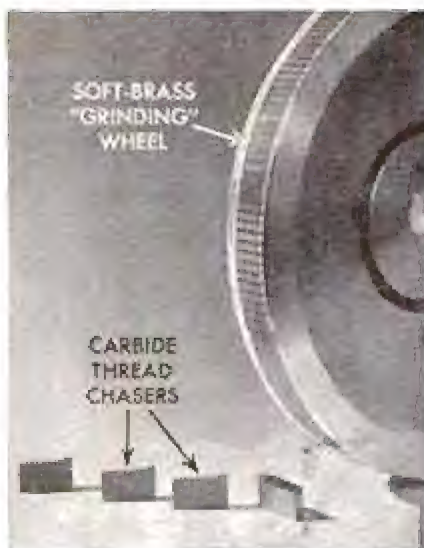
The rate of metal removal is constant for any one metal if the power supplied to the tool is held constant. Where holes are to be bored through, a tubular electrode (tool) is used instead of a solid rod. The tube cores the hole through much faster than solid-rod boring, due to the lesser amount of metal that has to be removed. When recessing, diesinking or drilling shallow holes, a solid tool usually is used. In common practice the work is placed in a specially made tank or tray containing the dielectric coolant. Various coolants are used, such as mineral oils, carbon tetrachloride and petroleum jelly. As a rule, clamps are unnecessary as there is



A typical spark-machining setup shown diagrammatically above and at right using hollow electrode through which a dielectric coolant is forced under pressure. The hollow electrode removes metal at a much faster rate than does a solid electrode. Note core formed inside tool

Drawing by Elox Corp.





Photos by Elton Corp.

Photo at left pictures a tapping operation, using a special electrode, or "tap." Center view shows a brass grinding wheel used to cut carbide. Right, a piercing tool, or die, cuts cavity of same shape

no contact between the tool and the work while the unit is in operation, but work of an irregular shape may require blocking and clamping to prevent it from tilting out of proper alignment.

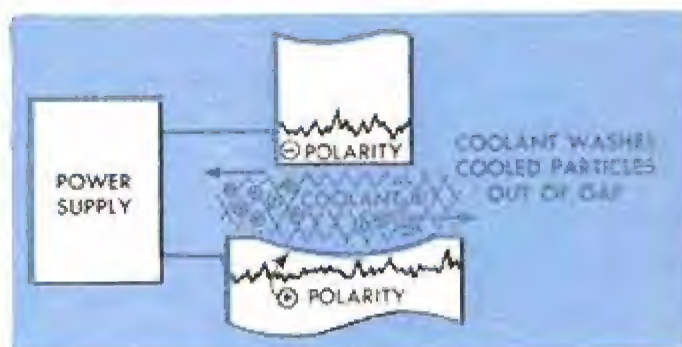
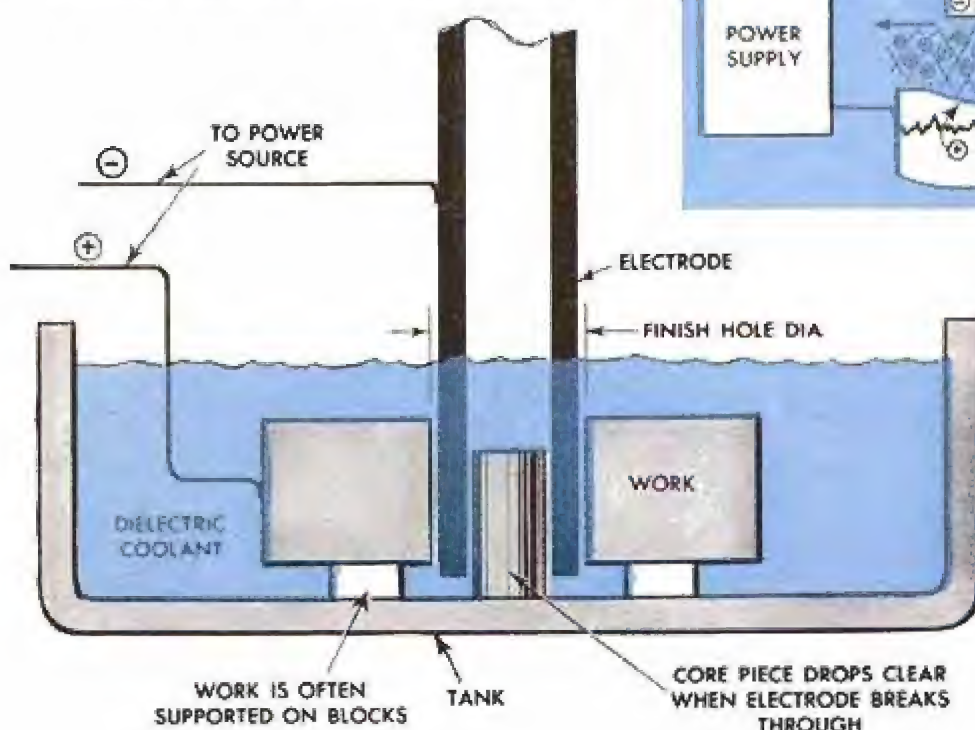
Operation of Machine

Although both rotating and vibrating electrodes (tools) are in use, machines of the type pictured have nonrotating electrodes electrically controlled to maintain a preset gap between the tool and work and at the same time to compensate for tool erosion. Once the setup is made and the machine placed in operation it is fully automatic, and requires no adjustment or other attention. Some machines have four working speeds: Roughing, semifinish, finish and microfinish. With adjustments it is possible to attain a 10-microfinish and hold tolerances of .0005. Where pre-

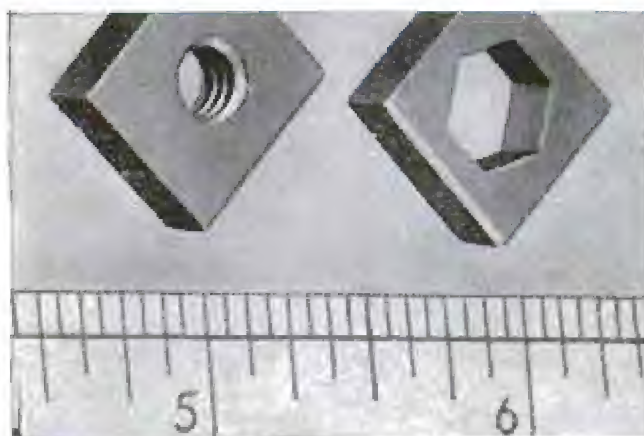
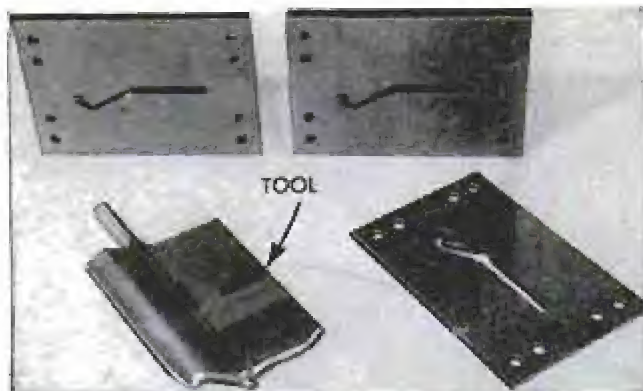
cision is essential the work usually should be done in three stages: Roughing, semi-finishing and finishing steps. By this procedure it is possible to correct any slight errors that may develop in the first two operations. Also, on precision work it's a fairly common practice to run tests on pieces of the same metal as the work piece. This is done to determine the required size of the tool, especially where the electrode (tool) is of a more complicated shape or pattern.

Cutting Tool Construction

In operation, the tool is worn (eroded) away as well as the work, although at a



Note in the diagram at the left that finished diameter of hole is larger than the electrode. This is due to necessary spark gap which must be maintained throughout operation. In all diagrams the relative width of spark gap is greatly exaggerated for purposes of clarity



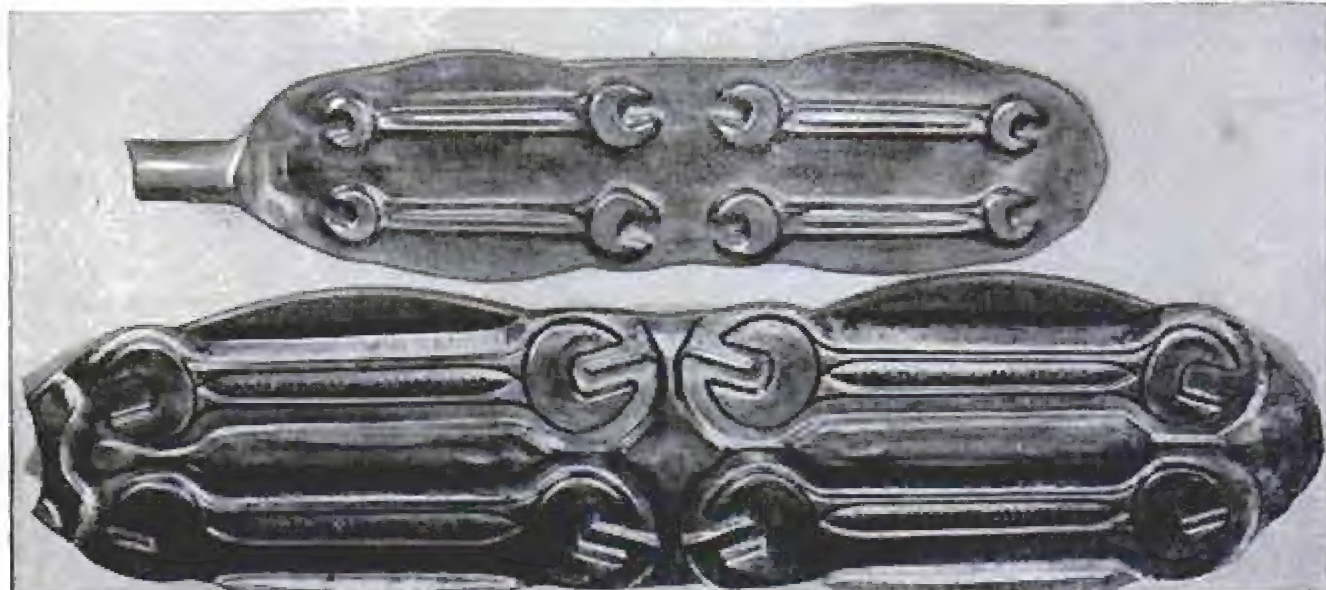
Left and center, examples of work done by spark machining with tools (electrodes) of various shapes, or patterns. Work can be pierced or recessed as shown

much slower rate. This is due to the heat generated in the immediate vicinity of the arc and also to the friction of metal particles in the coolant fluid. In many types of work, tools made from brass containing about 40 percent zinc appear to give the best average results. However, tools made from brass may not always combine the highest productivity with maximum wear resistance. The wear rate of the tool can be controlled to a certain extent by lowering the power input or selecting a more wear-resistant tool material. One factor that sometimes controls the selection of tool material is the cost of shaping the tool to the desired form. Easily worked materials such as brass are often selected on this basis alone and in some cases metals that can be pressed or cast, such as aluminum and iron, are often preferable.

Tools used for spark machining generally are of two major types, those having a sectional profile and those having complete profiles. The sectional, or partial-profile, tools generally are used for large holes, recesses, or other types of work for which a solid tool would be prohibitive in first cost. Where high precision and fine finish are required, complete, or full-profile, tools are commonly used. In some instances where highest productivity is the main objective, composite tools and multiple-circuit wiring are resorted to, each electrode of the composite tool being wired to a separate condenser. Various common examples of work done by spark machining are pictured on this and the preceding pages. ★ ★ ★

Left, an example of work on small parts. Note relative size and accuracy of the tapped and hex holes. Below, a forging die recessed by spark machining

Photos by Elox Corp.



Wedge-Shaped Pie Plates Are Handy Workshop Sorting Trays

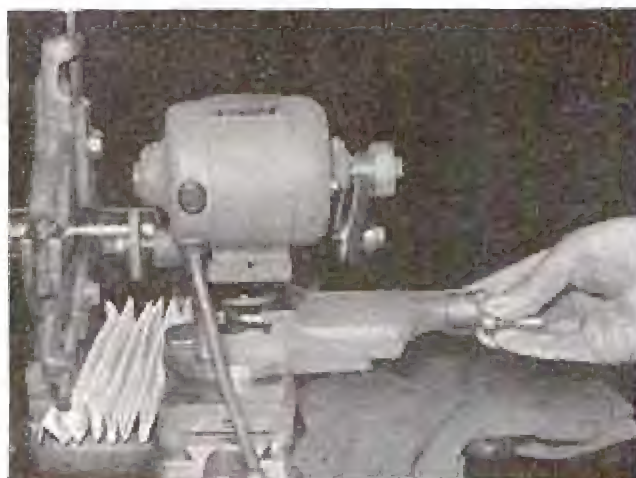
Pie plates having a wedge-shaped design to hold individual servings can be utilized in the home workshop as sorting trays. Lay them out in a circle on the bench or place them in a compact row along a shelf by alternating the points. When empty they can be stacked one on top of another. As you prepare for a project place a quantity of each type of screw or nail to be used in a separate tray where they will be convenient to your work. When finished, pour the remainders back into their respective containers using the point of the tray as a funnel. Mixed nails and screws can be poured out on a tray to find a specific one and then funneled back.



"Pleated" Paper Keeps Grit Out Of Metal-Cutting Lathe

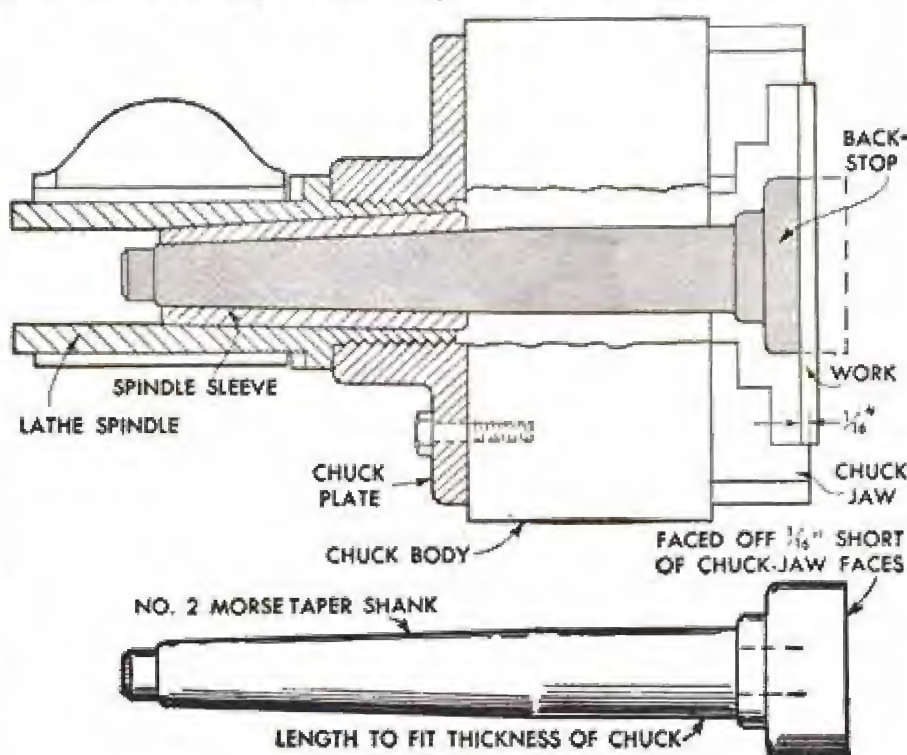
When using a tool-post grinder sparks sometimes ignite the cloth ordinarily used to keep abrasive particles off the lathe bed. A simple solution for this is a piece of heavy paper folded accordion style and placed on the bed between the headstock and the carriage. The paper expands and compresses as the carriage is moved along, keeping the bed covered at all times. Sparks strike the folds at a glance and cool off before reaching the bottom of the folds.

John Imbery, Regina, Sask., Can.



Backstop Permits Disks To Be Quickly Trued Up in Lathe Chuck

A backstop fitted to a No. 2 Morse taper-shank, as indicated, will eliminate much of the time and work in truing disks and other thin work. The length of the shank is determined by the thickness of the chuck, as shown in the detail. The backstop itself is drilled and bored to a press fit on the shank. After the stop is driven onto the shank, the assembly is mounted in the chuck and faced off so the disk is $\frac{1}{16}$ in. short of being flush with the face of the chuck jaws, which permits work to be trued to within a fraction of an inch of that dimension.—C. W. Woodson, Chicago.



LATHE HINTS

Accessories you can make on your own lathe, also setups that simplify and speed up unusual jobs

By C. W. Woodson

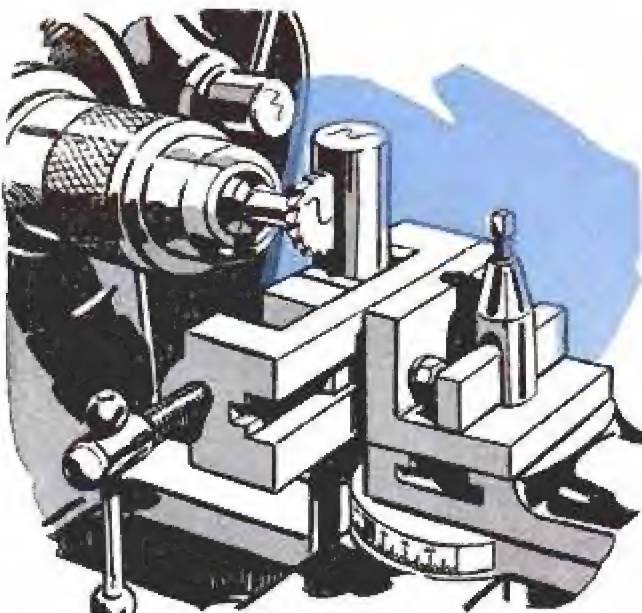
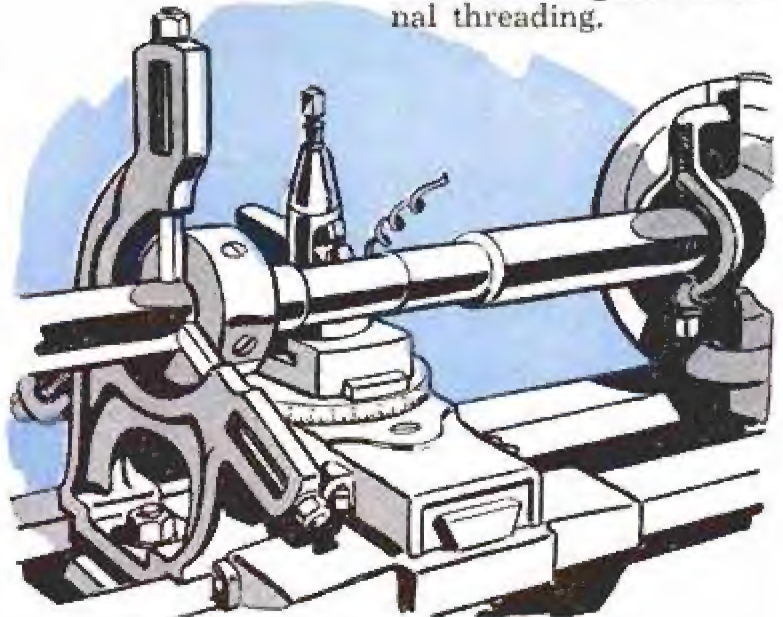


Deep Boring

When running deep bores in work of varying diameters, it's an advantage to have the boring bar mounted on an eccentric sleeve for quick adjustment of overhang and position of tool bit in relation to lathe axis. Eccentric mounting of bar also is an advantage for internal threading.

Steady-Rest Setup

When the job calls for running two shoulder cuts from a central point, or when working long stock which is beyond the capacity of the lathe, the setup pictured often proves helpful. By locating a collar to bear against the jaws of the steady rest it is possible to drive the work with a dog rather than mounting in a 3-jaw chuck. This type of setup often prevents chatter marks on long work of small diameter when other setups fail. Mounting on the live center and driving by a dog also prevents any tendency of the stock to whip due to slight misalignment with steady rest.

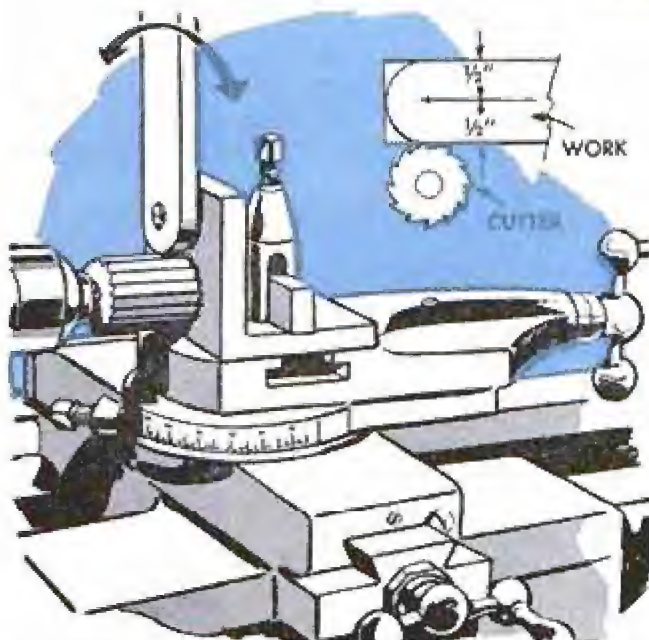
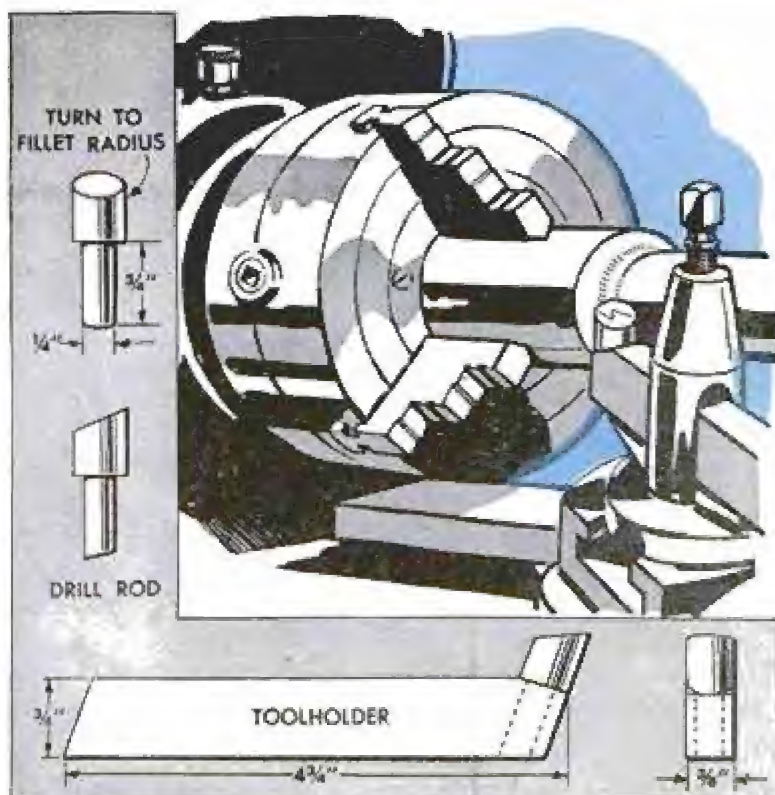


Cutting Keyways

Woodruff keyways are easily cut in the lathe, the work being held vertically in a drill-press vise mounted on a small angle plate. One web of the angle plate is drilled to fit over the tool post and a short length of bar stock is inserted in place of the tool-holder. When the tool-post screw is tightened, the angle plate is held securely in position. The vise is bolted to the vertical web of the plate and care must be taken to locate the jaws perpendicular to the lathe ways. The keyway cutter can be driven by means of a collet chuck or a geared chuck of the type that screws onto the spindle nose. The work is hand-fed to the cutter by means of a cross-feed screw.

Fillet Cutter

Perfectly formed fillets on a shoulder cut are possible with this special tool you can make in your own shop. For cutting mild steel and the softer metals, the cutter can be made from ordinary drill rod, the diameter of the drill rod depending on the radius of the fillet. The holder is made from a length of bar stock, one end being beveled and drilled to take the shouldered end of the cutting tool in a drive fit. A cutting edge is formed on the tool by grinding the end at an angle. An angle of about 60 deg. will be suitable for average work. For brass the angle should be somewhat greater. When using this tool take very light cuts as otherwise it may leave fine chatter marks on the fillet.

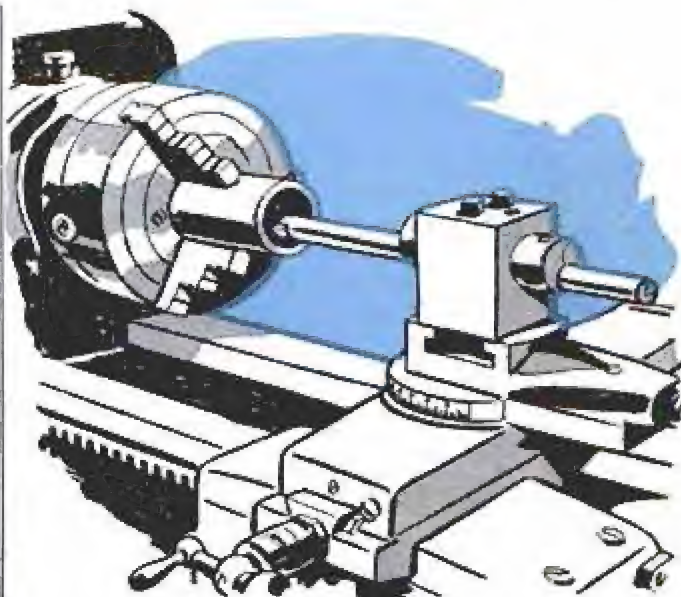
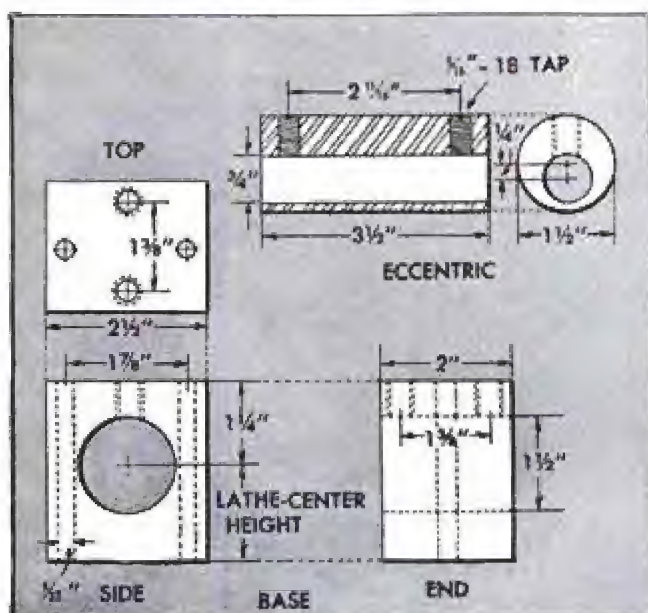


Milling Radius

One machinist made the setup pictured to mill a true radius on the ends of a number of identical pieces of flat stock 1 in. wide. To mill the end the stock is moved through a 180-deg. arc, either forward or backward depending on the direction of rotation of the cutter. As a rule it is best to reverse the lathe.

Boring-Tool Holder

Details below at the left show how to make an eccentric boring-bar holder for deep boring and internal threading. It consists of a base of mild steel and an eccentric bored $\frac{1}{4}$ in. off-center to take a round-bar toolholder. This type of holder is exceptionally steady in deep bores.



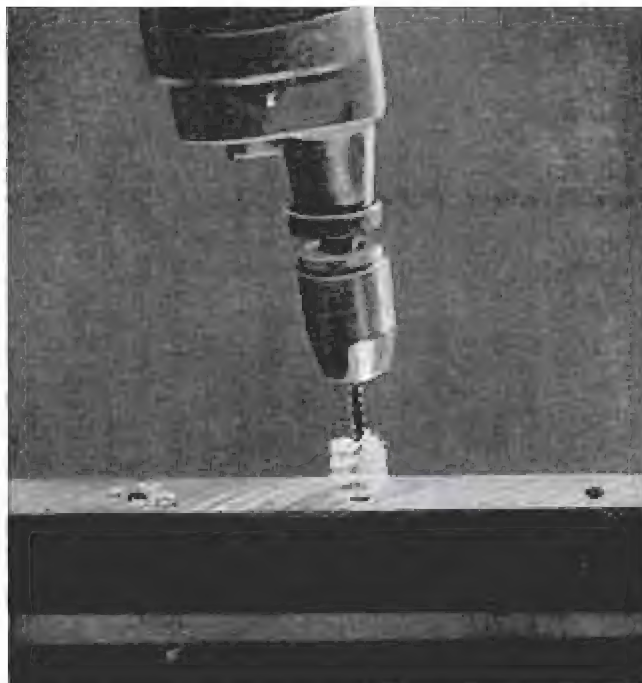


Cotter Pins Held Between Bricks Prevent Sag in Mason's Line

A mason's line that is used on a long wall can be prevented from sagging when one or more cotter pins are slipped on the line and anchored between bricks at regular intervals as shown. It may be necessary to arrange some bricks on the wall temporarily to provide suitable support for the cotter pins at the desired intervals. The pins can be left on the line when it is not in use.

Power Brush Cleans Blind Holes

Blind holes drilled in wood or metal are cleaned easily with a small, round brush fitted in an electric drill. A small bottle or test-tube brush having most of the long wire handle cut off before mounting it in the drill chuck will do.



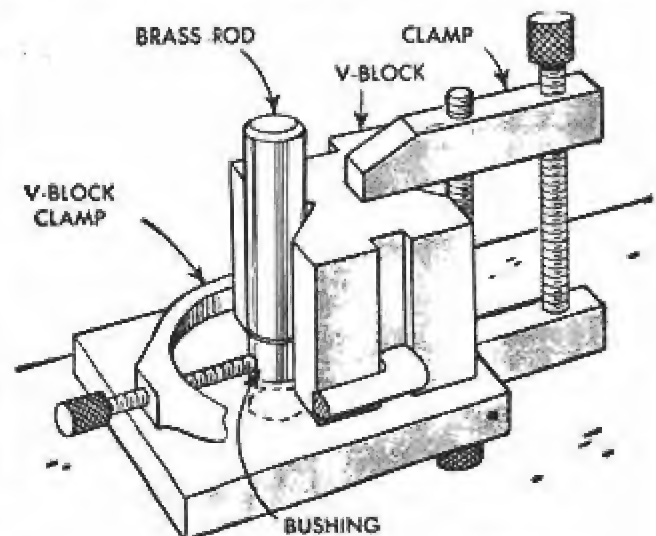
Door Veneer Cut With Knife Prevents Saw Damage

When a door in your home has to be shortened, it can be sawed without splintering the veneer if a cut first is made through the veneer with a linoleum knife. First, measure the door carefully, mark the saw line on both sides and cut through the veneer with the knife as shown. To be sure that the saw stays in the knife cuts, hold the door vertically when sawing through the core, so the blade can be watched on both sides of the door.

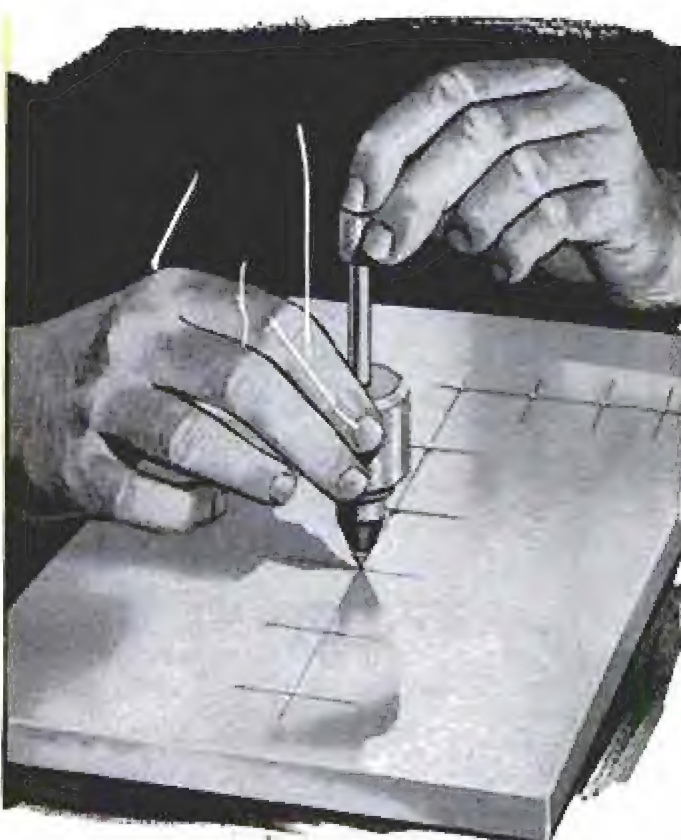
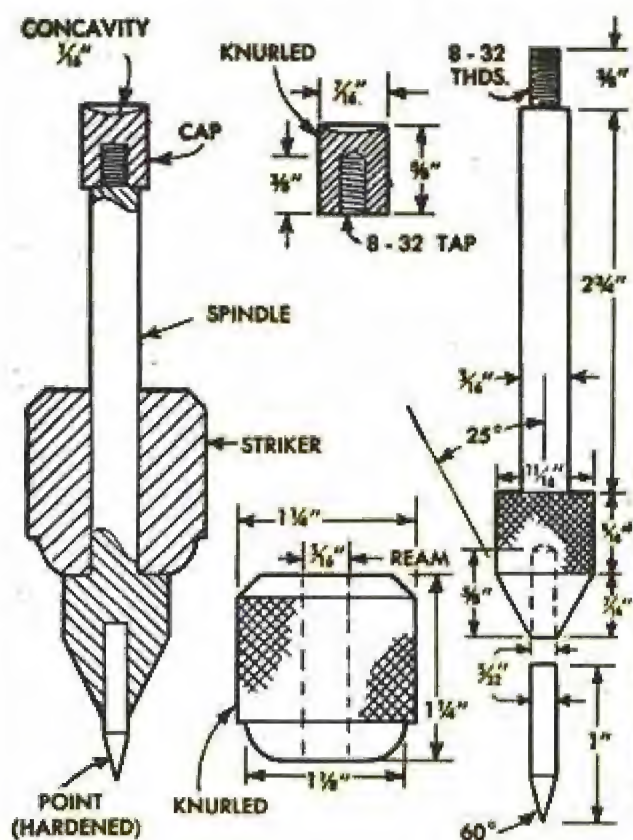
Stuart Foster, Columbus, Ohio.

V-Block Guides Bushing Into Jig-Plate Hole

Pressing a round bushing straight into a drill-jig hole can be done easily with the aid of a V-block and a machinist's clamp. Set the bushing in line on top of the hole, place a V-block against it and screw the block clamp, finger tight, against the bushing. Clamp the block and jig plate together with the machinist's clamp as shown in the illustration, being sure that the bushing is still in line. Drive the bushing partially into the hole with a brass rod of similar outside diameter. Complete the seating of the bushing in a vise or arbor press.



Sleeve Weight Hits Punch in Place of Hammer



Layouts can be marked more rapidly with the center punch shown in the illustration above as a hammer is not needed to drive it into the work. Instead, a sleeve weight fitted on the spindle is raised and dropped delivering a blow of sufficient force to make an impression in the work.

The spindle and replaceable point are made from tool steel while the striker and the finger grip on the end of spindle are of mild cold-rolled steel. Cut a fine knurl

on the base of the spindle and place an 8-32 thread on the opposite end. Then center-drill the base to receive a short length of rod which is driven into the hole and ground to a 60-deg. point with the tool-post grinder on the lathe.

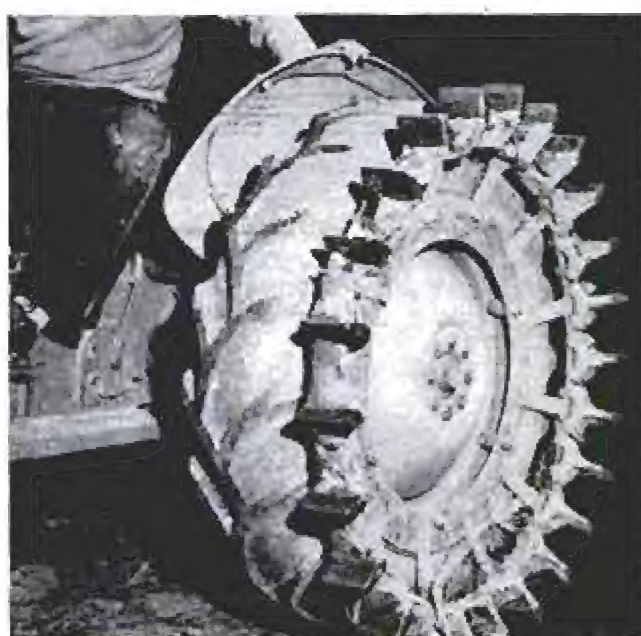
The sliding striker is turned from bar stock, knurled on the outside, center-drilled and reamed for a sliding fit over the spindle. A finger cap tapped to fit the 8-32 thread on the spindle locks the striker in place.

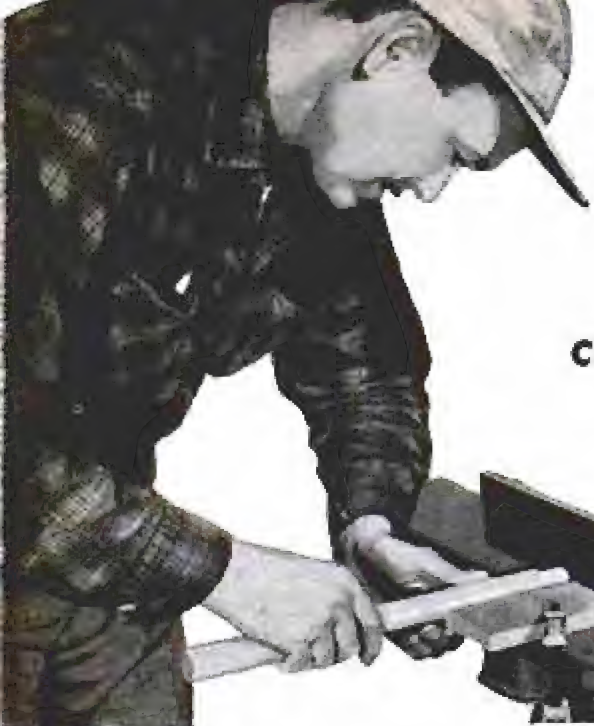
Lugged Rims on Tractor Wheels Give Traction on Wet Ground

Tractors equipped with an extra set of steel lugs on the outside of the rear wheels are driven easier and faster in wet fields, when working the ground or when hauling feed and water to fowl and livestock. The lugs bite into the ground preventing the rubber tires from slipping, since they are bolted together at the rim and revolve simultaneously.

Notched Oil-Can Spout Lifts Cap

An oil filler cap that is located in a difficult place to reach can be opened and an oil-can spout inserted if a small notch is sawed in the spout. The notch should be about $\frac{3}{16}$ in. from the end of the spout and at a 45-deg. angle. Hold the spout at a 45-deg. angle when filling with oil to avoid spilling it.—Bruce D. Stewart, Winder, Ga.





HOW WOULD

By
Chris Nelson

Q—I have to cut round, concentric tenons on a number of 1-in. dowels. I do not have a lathe. How do you do this job accurately?

A—YOU CAN DO IT ON A JOINTER. Set fence across table, measuring distance from outer end of knife to face of fence. This distance should equal length of tenon desired. Lower front table about $\frac{1}{8}$ in. and clamp a block to rabbeting arm so that it clears cutting circle. Run test cut on waste dowel. If size is over that required, move block nearer cutting circle and run a second test cut to give the correct size. Always rotate the stock in same direction jointer head is rotating

Q—How do you adjust a jointer so that the stock does not strike the edge of the rear table? And how do you set the knives in the head correctly?

A—STOCK STRIKING EDGE OF REAR TABLE indicates that surface of table is slightly above cutting circle of knives. Lay a hardwood straightedge on rear table. Lower table until each knife engages straightedge and moves it forward about $\frac{1}{4}$ in. as head is rotated by hand. Check both ends of each knife in this manner. If one knife is low (does not engage straightedge) adjust to correct height. After adjusting, be sure knives are locked in head before starting machine



Q—When depth gauge on a jointer does not give the correct depth setting, how is it adjusted to give the proper reading?

A—LEVEL THE TABLES, first making sure rear table is correctly set in relation to cutting circle of knives. Use steel square or other straightedge long enough to reach very nearly full length of tables. Set pointer at "0." Then lower front table $\frac{1}{8}$ in. and run test cut about 1 in. long on piece of waste stock. Measure the depth of the cut. If it is slightly off, raise or lower table as indicated by depth of cut and run test cuts, adjusting table after each cut, until depth is $\frac{1}{8}$ in. Then reset the scale



Q—How do you set the jointer fence perpendicular to the surface of the tables when the angle scale does not give a precisely correct reading?

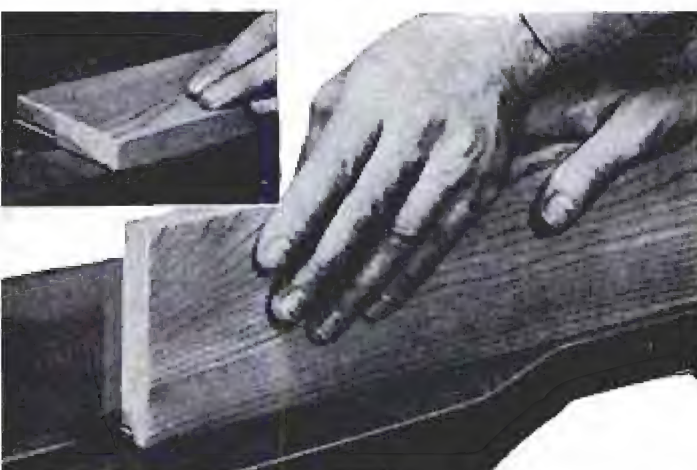
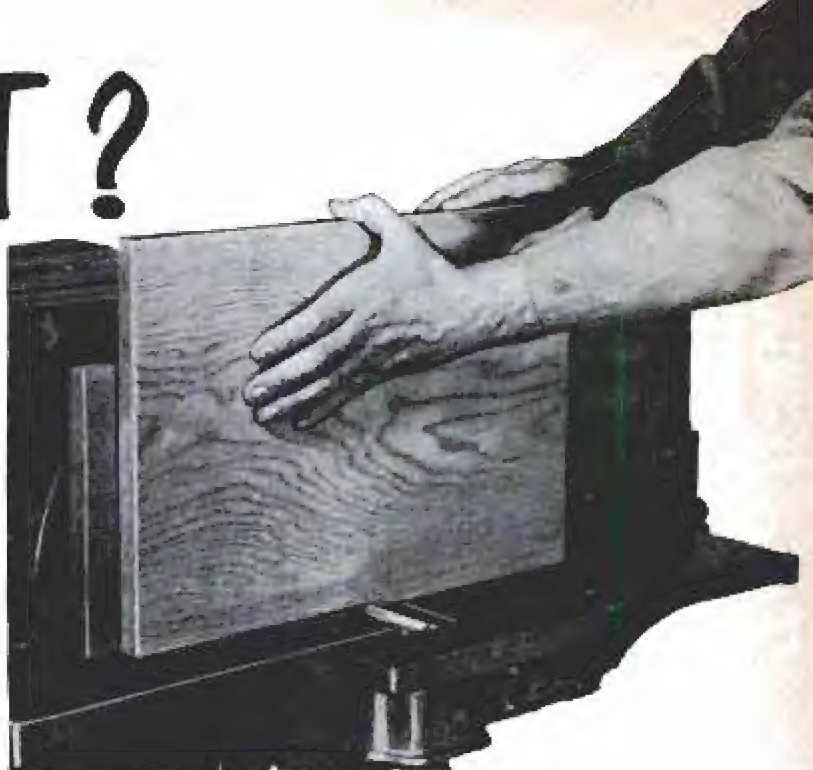
A—PLACE A COMBINATION SQUARE on the table as pictured and tilt the fence right or left until no light can be seen between the edge of the blade and the vertical surface of the fence. Lock the fence in position. Then adjust the pointer to give a "0" reading on the scale. If necessary bend the pointer slightly to bring the point closer to the surface of the scale. This will make it easier to read the depth of cut accurately. Plane one face of a strip of stock true and run a test cut. Check with the square



YOU DO IT?

Q—How do you joint a wide board on a small jointer, especially when the width of the board is more than twice the height of the fence?

A—MAKE AN AUXILIARY FENCE of plywood about 8 in. high and slightly longer than the jointer fence. Joint the edges true and attach the auxiliary fence to the jointer fence with screws. Unless you are certain of the jointer-fence setting, check with a combination square (as pictured on the opposite page) and then see that the angle scale gives the correct reading. Set the machine to take a 1/16-in. cut. If more than 1/16 in. of stock must be removed, make the cut in two or more passes

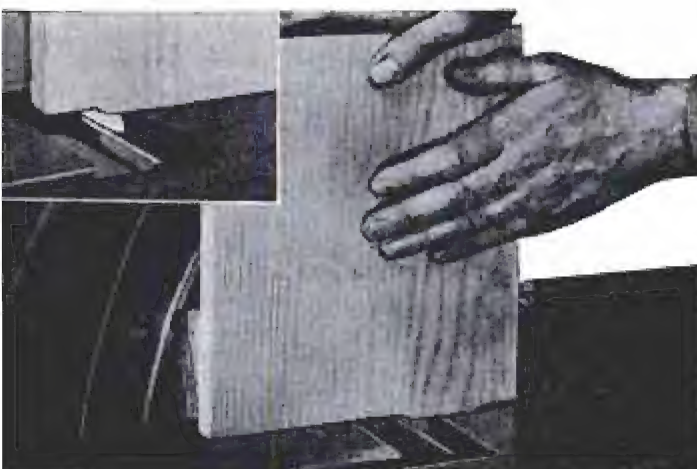
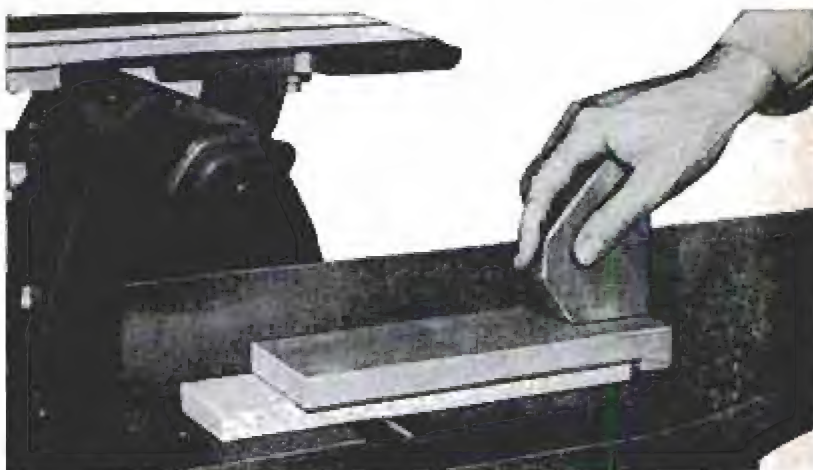


Q—How do you joint the end of a board to prevent splintering of the wood as the corner of the stock clears the cutterhead?

A—MAKE THE CUT IN TWO PASSES by first running in from one edge a distance of about 1 in. as in the inset photo. Then reverse the stock and finish the cut from the opposite edge. If the stock to be end-jointed is more than 1 ft. long, it's a good idea to use an auxiliary fence as in the photo above. This gives a wider bearing surface and assures greater accuracy by preventing the stock from tipping

Q—How do you guard against injury to the fingers when planing short pieces? Also, how do you plane thin stock?

A—USE THE GUARD AND A HOLD-DOWN. Jointers come equipped with a swinging guard which covers the exposed portion of the head. In all photos on this and the opposite page guard has been removed purposely. Use guard on all operations except rabbeting. Plane thin stock with a hold-down made as in the photo. It should have a pusher handle and an offset to carry the stock forward as the cut is made. It is not safe to work stock shorter than 6 in. long on small jointer



Q—How do you cut rabbets on the jointer? Suppose you need to rabbet the edge or the flat surface. How are these cuts made?

A—NEARLY ALL JOINTERS are fitted with a rabbeting arm designed to support the overhang when making this type of cut. Ends of the jointer knives are ground to a cutting edge and it is important that ends are lined up when knives are replaced in head after grinding. To cut rabbet on edge of stock, move fence across table and measure distance from end of knife to fence. Lower front table to give depth of rabbet as required. Run cut with stock on edge as pictured. Use same setup for face-rabbeting

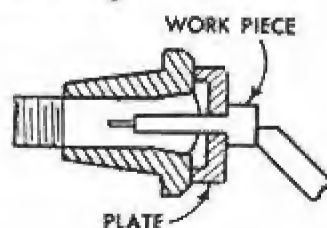
Hydraulic Jack With Pipe Extension Used to Repair Building



Fitted with a pipe extension, a hydraulic jack can be used to brace a small building or to raise a sagging floor or ceiling. The extension is screwed into a coupling which is welded to the end of a 1-ft. length of 1¼-in. pipe that has a welded and riveted plug half way up in it against which the pad of the jackscrew bears. A hole is cross drilled in the pipe coupling for the jack handle so that only one wrench is needed to screw on pipe of the required length. With the jackscrew raised a few inches, the short piece of pipe is placed down over it and the longer extension screwed into the coupling.

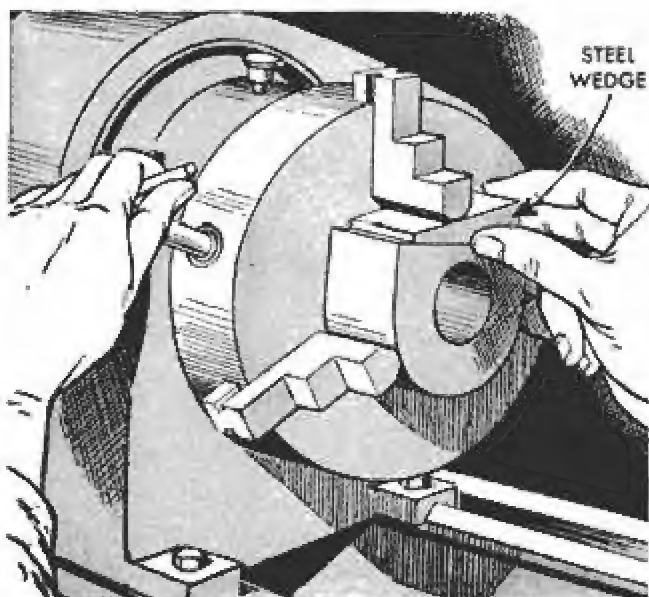
Collet Plate Improves Accuracy Of Duplicate Machining

Rather than depend on the accuracy of the collet as a stop, one machinist turned a special recessed plate which enabled him to hold the final facing operation on shouldered parts to extremely close limits. In the setup, the rim of the plate bears against the face of the collet closer, with the shouldered end of the work passing through a clearance hole center-drilled through the plate. In operation the plate serves as a positive locator for positioning duplicate work relative to the transverse travel of the cutting tool.—Hans Bonheim, Fair Lawn, N. J.



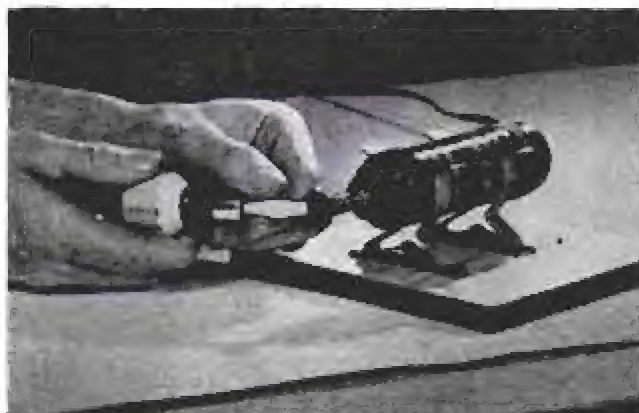
Centering Irregular Work In 3-Jaw Lathe Chuck

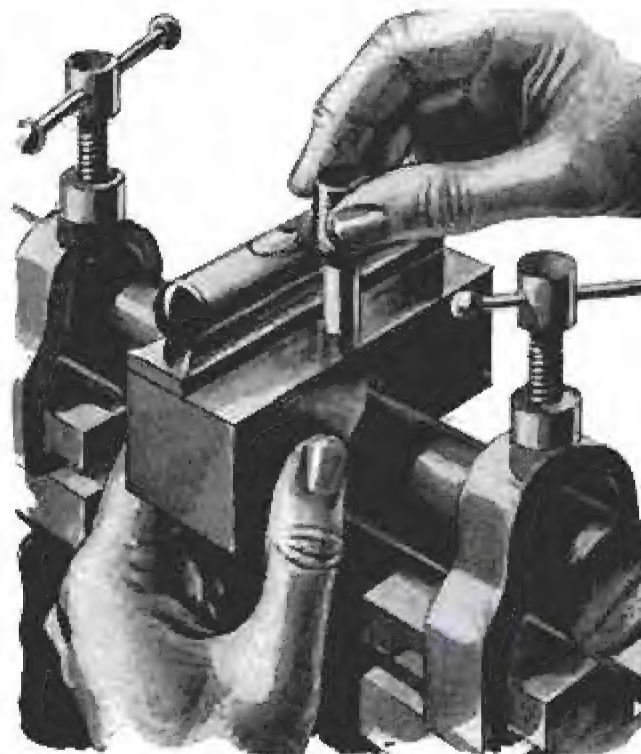
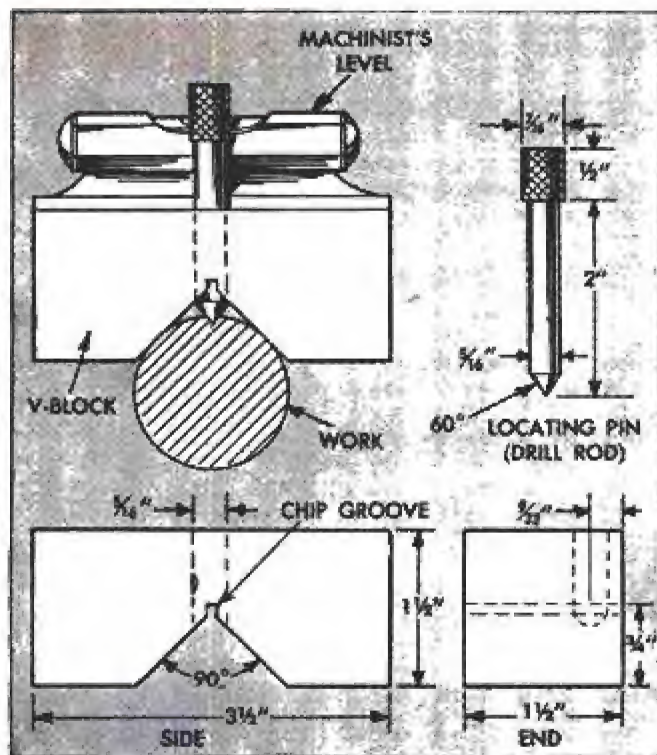
Out-of-round or irregularly shaped work with one flat side can be clamped in a 3-jaw lathe chuck by inserting a small metal wedge under the loose jaw. Careful adjustment of the wedge as the chuck jaws are closed will permit accurate centering of the work. If the irregularity in the work is only slight, shim stock can be used instead of a wedge. Wedges and shims also are useful for centering cylindrical work in a 3-jaw chuck when one of the jaws has been damaged and does not close accurately in comparison to the other two.



Broom Clips Hold Hand Grinder

Broom-handle clips of the type shown hold a hand grinder in a horizontal position when they are mounted on a wooden base and adjusted to grip the grinder securely. This arrangement is desirable when it is more convenient to hold small parts to be ground than it is to hold the grinder. Also, the grinder can be used as a midget lathe with this method of mounting.





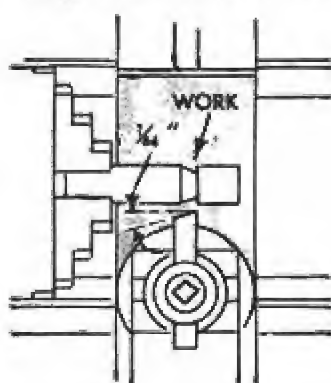
Locating Round Stock for Transverse Drilling

Confronted with the problem of drilling transverse holes through round stock on a small job-shop run, one machinist devised the setup pictured for locating the holes accurately. As the first step, a single V-block is milled from C. R. steel and drilled to take a $\frac{1}{8}$ -in. locating pin, the end of the pin being ground to a 60-deg. point. Then the work is center-punched and mounted in a set of V-blocks and clamps. The clamps are tightened just sufficiently to hold the work in place. After leveling

the drill-press table with a machinist's bench level, the work setup is moved to the drill-press table and the single V-block with the locating pin in place is inverted and placed over it. The bench level is placed on top of the single V-block and the block is moved until the locating pin engages the punch mark on the work. Turning the work and V-block to the level position centers the punch mark. Then the clamps are tightened.

C. W. Woodson, Chicago.

Angled Cutoff Tool for Tubing



When cutting off lengths of brass tubing in a lathe for use as bushings or spacers, a cutoff tool with a special point ground $\frac{1}{8}$ in. from the square minimizes the tendency for burrs to form on the piece that is cut off. The special

tool is simply an ordinary square lathe bit ground as in the detail, except that the angle of the cutting edge shown is exaggerated for purposes of illustration. The angle helps to prevent chatter marks.

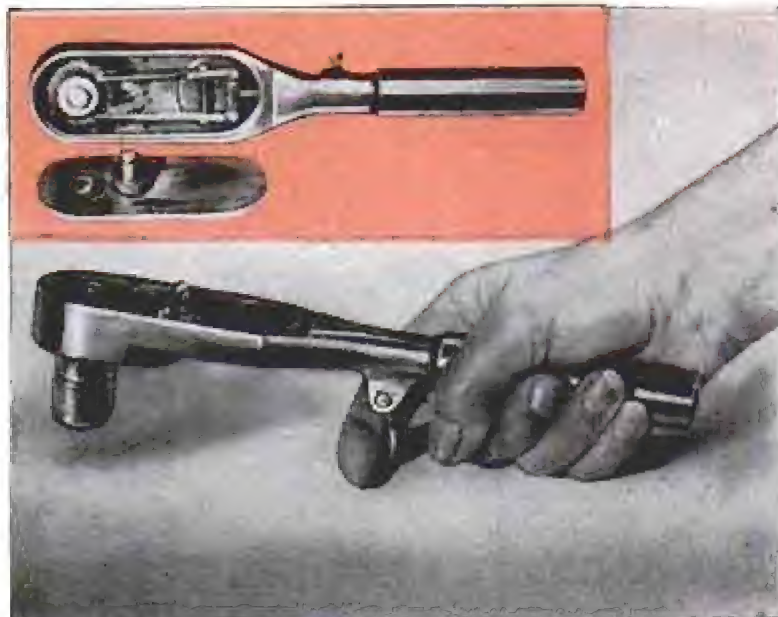
Charles E. Cohn, Chicago.

☐ Several moth balls in each drawer of your toolbox will help prevent the metal parts of tools from rusting.

Pipe Cleaners Protect Taps

Thread-cutting taps can be protected when not in use by wrapping them with pipe cleaners, which will cover the sharp cutting edges. A drop of oil applied to each tap when it is wrapped will prevent it from rusting. Following this practice is of special importance when taps must be stored loose in a box with other tools.





SOCKET DRIVER combines a spinner and ratchet wrench in one handy tool. Using spinner, nuts or capscrews are run on or off by trigger action which turns driving stud right or left throughout free-running range of thread. As nut seats, mechanism is shifted from spinner to ratchet and nut is tightened by ratchet action. In removing nut, procedure is reversed. Short radius of driving head permits work in close quarters. Cover plate prevents entrance of dust. Short movement of one lever reverses both spinner and ratchet, one being disengaged while the other is in operation

Edwin R. Sage, 2429 California St.,
Huntington Park, Calif.

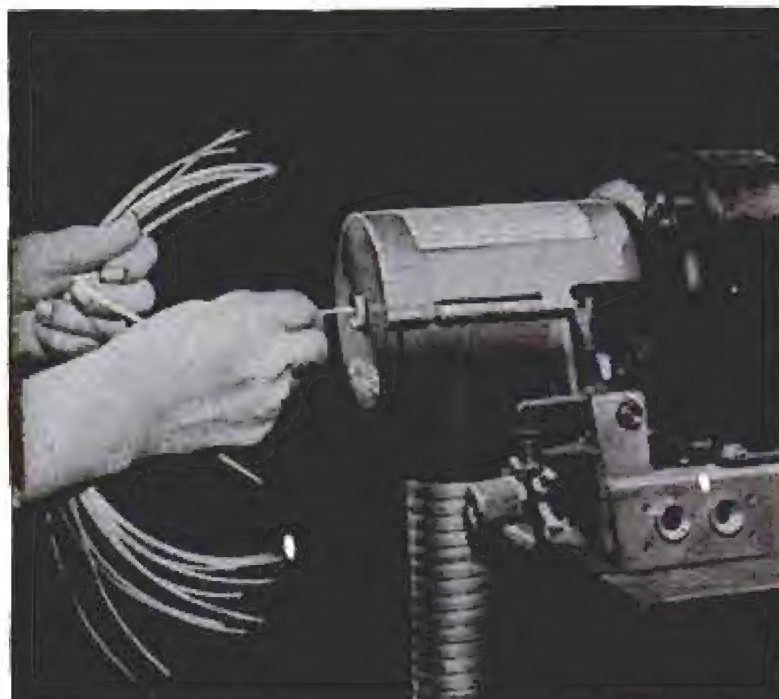
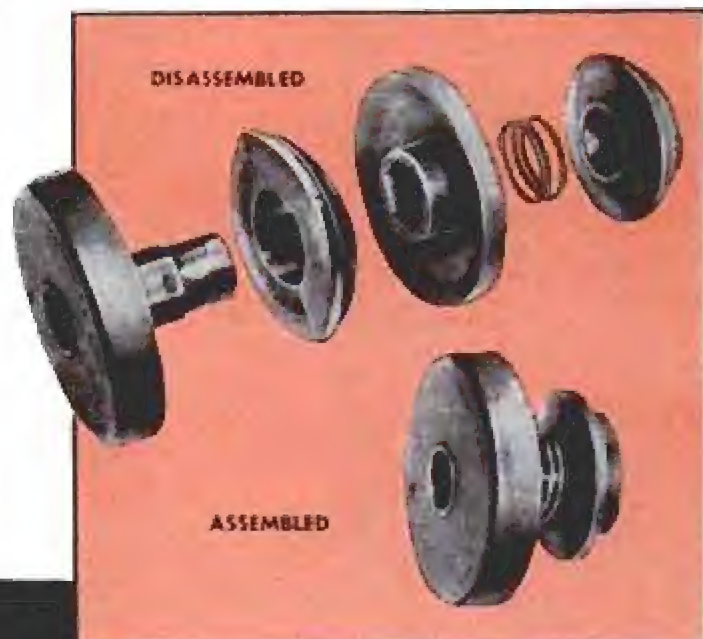
CLUTCH FOR V-BELT DRIVES on lawn mowers, pumps and other mechanisms of similar power requirements, stops and starts the unit automatically when the speed is changed. It consists of the several parts shown disassembled and assembled at the right. At idle speed halves of split sheave open. This releases tension on the V-belt and stops the driven machine. As speed is increased the spring-loaded governor weights force the halves of the sheave together, increasing tension on V-belt and starting driven machine

V-Plex Clutch Division, Hagerstown, Ind.

ROTARY WIRE-STRIPPER ATTACHMENT removes glass-fiber insulation from 12 different sizes of wire. The dial mechanism is coupled directly to the rotary blades which are power driven. This arrangement reduces the area between the cutting edges to a minimum. Strips the various sizes of wire clean to the bare metal without scoring. Reduces stripping time by 50 percent or more where large quantities of wire of various sizes are used. Accuracy and uniformity of the work hold material losses to the minimum

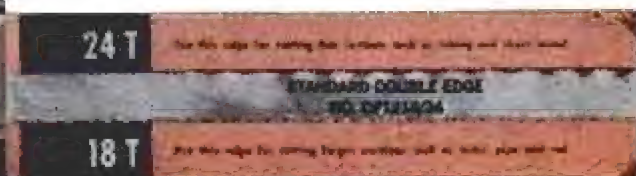
Public Relations, Northrop Aircraft, Inc., Hawthorne, Calif.

SHOPPING



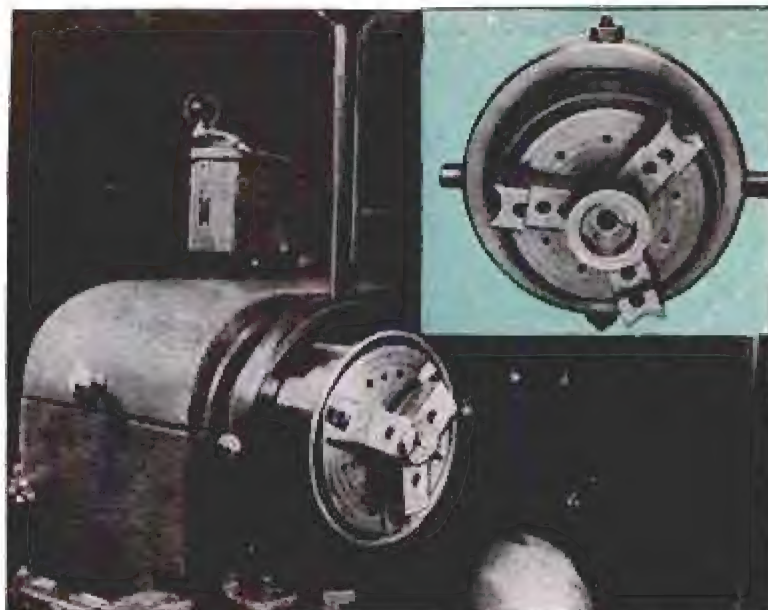
DOUBLE-EDGED HAND HACKSAW BLADE has two cutting edges, one for heavy cutting, the other for light work requiring fine teeth. Use coarse-toothed edge for hacksawing bolts, steel rod, standard pipe and steel angles. Simply turn blade over when cutting thin sections such as sheet metals, thin-wall tubing and conduit and light steel angle. Coarse side has 18 teeth to the inch, the fine side, 24

G. W. Griffin Co., Franklin, N. H.



UNIVERSAL COLLET CHUCK combines the features and advantages of the conventional collet closer into one production lathe tool which is operable positively and quickly with the spindle stopped or rotating. Collets are closed radially, eliminating any tendency of the work to creep. Comes with soft jaws. The chuck will repeat on piece location within .0005. When used as an o.d. chuck the symmetric soft jaws can be machined to suit the job requirements and, since the jaws are reversible, each set can be used for several different types of precision jobs

The Johnal Co., 18361 Parthenia St., Northridge, Calif.



FOR TOOLS



ADHESIVE DISPENSER, OR APPLICATOR, is fountain-pen size, ejects a small drop of adhesive just where you want it when mounting photos or making layouts and pasteups. Artists and draftsmen especially can appreciate its convenience and simplicity. Various adhesives are available in throw-away plastic refill containers. It comes equipped with a cap so it can be carried in the pocket without danger of leakage of the adhesive. Special tip positively prevents clogging

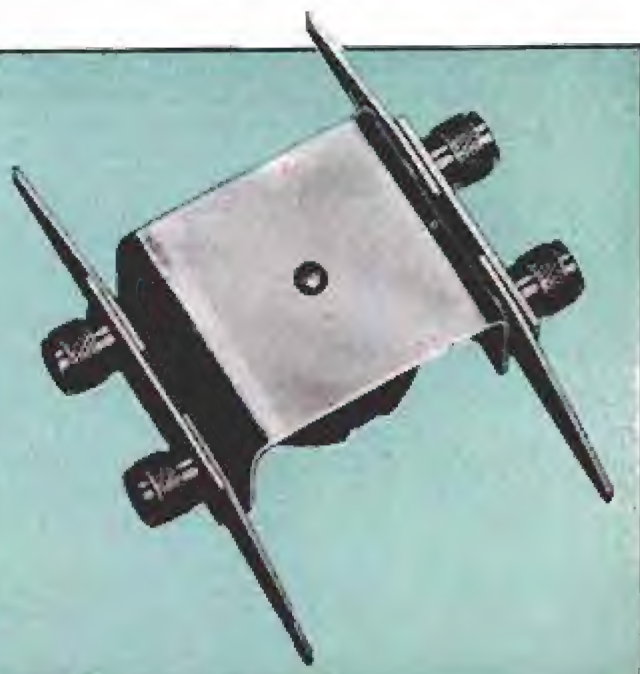
Poppet Corp., 8707 Hudson Blvd., North Bergen, N. J.

MAGNETIC KNIFE SETTER locates all three (or four) knives in a jointer head on precisely the same cutting circle and equalizes the load on each one. Accurate setting gives longer operating periods between sharpenings, smoother work and less wear on the bearings. Unit consists of a permanent magnet and adjustable holder as pictured below at the right. Magnet holds the knife while it is positioned in the head. Adjustable arms bear on inner ends of machine tables

Magna-Set Co., 632 New Haven Ave., Milford, Conn.

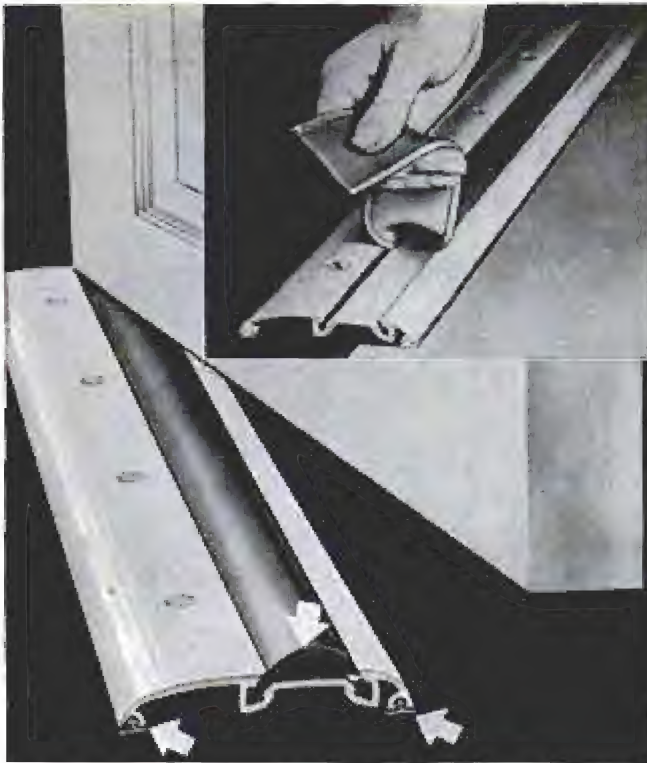
CHROMIUM-PLATED STEEL RULES come in 6-in. lengths with both tempered and flexible blades. Decimal graduations in tenths (.10) and fiftieths (.02) make it possible to transfer measurements in decimal parts of an inch without computation

Brown & Sharpe Mfg. Co., Providence 1, R. I.



SHOPPING FOR TOOLS

Continued from preceding page



ALUMINUM THRESHOLD has three weatherproof seals (indicated by arrows) of flexible plastic which are replaceable when worn. Plastic inserts form a positive seal at the door bottom and at the floor level. There are no parts attached to the door. Convex surface of the door seal sheds water. Seals at edges of threshold prevent entrance of water. There are no grooves to catch dirt. Attaches directly to floor with screws

Duraflex Co., 3500 N.W. 52nd St., Miami, Fla.



MICROMETERS have interchangeable anvils to handle a wide variety of measurements not possible to obtain with mikes having fixed anvils. Comes in two sizes with a range of 0 to 1 in. and 1 to 2 in. Two anvils are furnished as regular equipment with each mike, a rod anvil .120 dia. and a flat anvil .125 thick at one end and .060 thick at opposite end. Additional anvils can be made in the shop for special purposes

The L. S. Starrett Co., Athol, Mass.

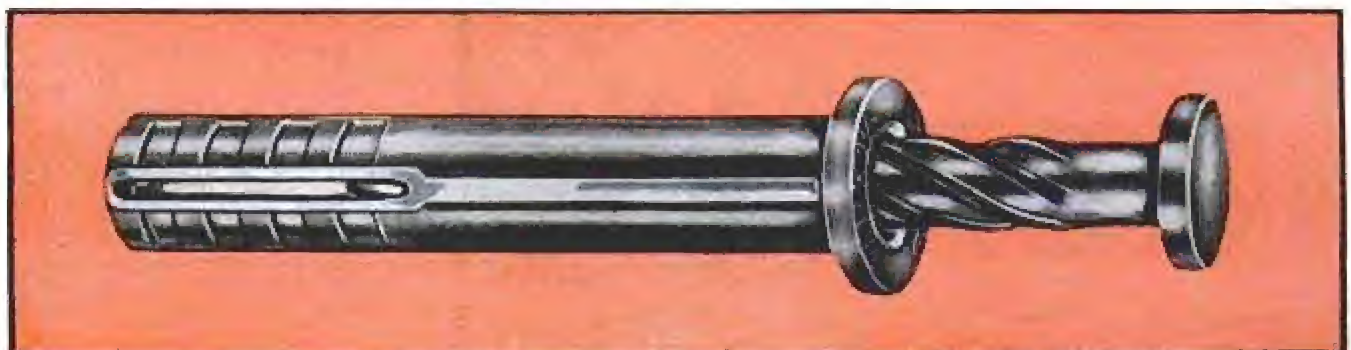


POCKET REAMER for cleaning $\frac{1}{2}$ and $\frac{3}{4}$ -in. solder fittings reams and sizes inside surface and squares end of fitting. Reamer consists of a holder, two guide pins and a blade. Fitting is slipped over guide pins and turned by hand, applying light pressure to handles of reamer to bring cutting edge in contact with inside surface of fitting. Takes only a few turns to clean the fitting ready for resoldering

Leystra Mfg. Co., 15-22 George St., Fair Lawn, N. J.

NAIL ANCHOR, pictured below, is die-cast in one piece from a special alloy that will not rust. Designed to give the greatest holding power with steel spiral nails in any type of masonry in which anchors can be used. Hole is drilled in masonry the same diameter as the anchor being used, then anchor is inserted through a fixture and nail driven. Anchors come in 13 sizes from $\frac{3}{16} \times \frac{7}{8}$ in. to $\frac{1}{2} \times 3\text{-}1\frac{1}{2}$

Arro Expansion Bolt Co., Marion, Ohio.





Now! Shoot the size of color slides you like best . . . **Kodaslide Signet Projector handles them all!**

You probably already know why Kodaslide Signet Projectors are the toast of discriminating color slide fans. Their thrilling "big-screen" performance and handling ease have made them famous.

You probably know, too, that there's a wide selection of Signets to choose from—one with exactly the features you want at the price you want to pay.

But did you know this? . . . *No matter which model you choose, your Signet will project all 4 popular sizes of color slides!*

Think of the satisfaction of being able to project 35mm slides, Bantam slides, *big* transparencies from size 620 or 120 color film—or even single frames of stereo slides. With a Signet, you can project your friends' slides—no matter which size they take!

Your Kodak dealer will gladly show you the Signet 300 (shown above) that comes complete with an automatic slide changer and carrying case for only \$79.45. Other superb Signets from \$59.50 to \$105.50. Most Kodak dealers will arrange convenient terms.

Kodaslide Dial-Lite Viewer—Plugs into any house circuit. Brightness knob dims or brightens light to suit subject being viewed. Accepts *all 4* popular sizes of color slides (described above). Complete with desk tray for slides and viewer, **\$12.95.**

Prices are list, include Federal Tax, and are subject to change without notice.

Eastman Kodak Company
 Rochester 4, N. Y.



Kodak
 TRADE MARK

3 Weldwood® Wizards for the perfect finishing touch!



Whether you prefer the light blond finish, deep mahogany or a painted job, insure the effect you want with a Weldwood finishing Wizard specialized for the job. Developed by United States Plywood, each meets a variety of finishing needs. Keep all three "wizards" on hand.

Pre-seal fir plywood paint jobs with **WHITE FIRZITE®**

A must for painting fir plywood! As an undercoater, White Firzite is a sealer and primer in one—it seals the pores to help avoid grain raise and checking. And if you want a woodsy blond, pickled, or wiped effect, start with White Firzite to get a real "pro" job without that painty look. (For pastel tones, add colors-in-oil.)



Pre-seal fir plywood stain jobs with **CLEAR FIRZITE**



Tames wild grain on fir plywood, to rival the subdued beauty of more expensive woods. Helps to prevent grain raise and checking. And for oak, walnut, or mahogany effects, simply add colors-in-oil—it's easy to get the effect you want.

Get that modern natural finish with **SATINLAC®**

Satinlac emphasizes and protects the natural grain of any wood—hard or soft, plywood or solid lumber. Fast-dry for fast finishing...dries out of dust in 3 to 4 hours. Long lasting and a cinch to maintain.



Ask your hardware, paint, or lumber dealer about these Finishing Wizards...or mail coupon for FREE leaflets.

UNITED STATES PLYWOOD CORPORATION
Box 525 — New York 46, N. Y. PM9-6S

Send me leaflets on:

☐ White Firzite ☐ Clear Firzite ☐ Satinlac

NAME _____

ADDRESS _____

CITY _____ ZONE _____ STATE _____

Clinic for Homemakers



As a service to our readers in solving the hundreds of problems pertaining to a home—inside or out—the editors of *Popular Mechanics* invite you to present your problems to The Clinic Editor for help and advice. Address your questions to The Clinic Editor, *Popular Mechanics Magazine*, 200 East Ontario Street, Chicago 11, Ill.



Brick Veneer

Q—I would like to veneer my frame house with brick. There is no basement. Foundation is poured concrete. A builder tells me he can excavate and pour a brick ledge along the existing wall from the top down to the footing, sloping it outward from the top down to a point flush with the lower edge of the footing. Is this permissible?—T. M., N. Y.

A—We assume the builder intends to anchor the brick ledge to the original wall by some practical means such as drilling spaced holes along the length, inserting anchor sleeves and turning in lag screws. Also we are assuming that the top of the new brick ledge will be only slightly above grade level. Otherwise we think the procedure you have outlined is permissible, although it must be understood that it is not orthodox construction practice. Also, you should make sure before proceeding that the addition of a brick ledge in the manner in question is in accordance with your local building code. All other practices common in building brick-veneer walls should be carried out. You do not say, but we assume the house is one-story. We do not think this procedure would be recommended for walls more than one story in height.



Fence Posts

Q—I live outside the city limits and I want to fence my property (about 1½ acres) with a rustic fence, plain but substantial. I've asked the opinion of several neighbors on what wooden posts to use; that is, those that will last the longest. They do not agree and I have about decided to use posts of red cedar. Do you have any other suggestion?

—Y. E., Ohio.

A—You could not go wrong in choosing red-cedar fence posts. They last many years, weather to an attractive rusticity, take nails, bolts or screws easily and come to you reasonably straight and of a fairly uniform size. These features lighten the job of setting the posts and attaching the boards or rails in any pattern or design you desire. However

(Continued to page 228)

NOW

-there's a Weldwood® Wizard for every gluing job!



Now there's a whole family of Weldwood Glues — four different types of adhesives — each designed to give you the easiest, quickest, surest answer to a particular gluing job. Be prepared by keeping all four of these "wizards" at your workbench.

Bond instantly, permanently on contact with **WELDWOOD CONTACT CEMENT**

Great new way to put up plywood panels — without nails — or nail holes to finish. Perfect for applying Micarta and other plastic surfacing materials. 1001 uses for home, hobby, garage — Weldwood Contact Cement holds fast to any combination of wood, rubber, canvas or any other porous surface. 29¢, 40¢, 70¢ and larger.



Make wood-to-wood joints stronger than wood with **WELDWOOD Plastic Resin GLUE**

Pros and hobbyists alike rate it America's most popular wood glue. Weldwood Plastic Resin Glue makes joints that are actually stronger than the wood itself, and keep growing stronger. Economical, easy-to-mix powder. Highly water-resistant, stain and rot-proof. 15¢, 35¢, 65¢ and larger.



For all outdoor gluing—use **WELDWOOD WATERPROOF RESORCINOL GLUE**

So waterproof it exceeds government specifications for marine use! 100% reliable for boatwork; fixing sports equipment such as fishing rods; repairs in basements; making or mending outdoor furniture. Unaffected by climate, weather, water (even boiling, freezing and salt water!), mold, fungus, mild acids, alkalis, etc. ¼ pts., \$1.00. Also available in pts., qts., gals.



Weldwood perfects a ready-to-use white glue— **WELDWOOD PRESTO-SET® GLUE**

Ready to use — sets fast — bonds like magic. So clean and easy to work with for scores of everyday household and hobby purposes. Use this Weldwood-perfected white glue to bond wood, cloth, paper, fabrics, etc., in any combination. Now in easy-to-use plastic dispensers. 19¢, 29¢, 49¢ and larger.



Remember—

There's a special Weldwood Wizard for every gluing job. Ask your lumber, paint or hardware dealer... or mail coupon for FREE leaflets.

UNITED STATES PLYWOOD CORPORATION

Box 525 — New York 46, N. Y.

PM9-66

Send me leaflets on:

- ☐ Weldwood Contact Cement
- ☐ Weldwood Plastic Resin Glue
- ☐ Weldwood Presto-Set Glue
- ☐ Weldwood Waterproof Resorcinol Glue

NAME _____

ADDRESS _____

CITY _____ ZONE _____ STATE _____

Care and Feeding of Engines



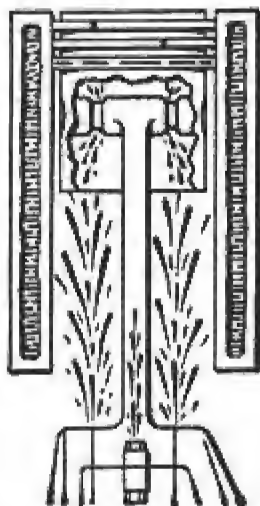
BY
S. P. CORP

BREAKING IN AN ENGINE

Correct engine loading and good lubrication are important in breaking in a new or reconditioned engine. Low-speed idling may cause scuffing of rings. Idle speed of 25 to 30 miles per hour insures lubrication of rings, cylinder wall, pistons, and valve parts.

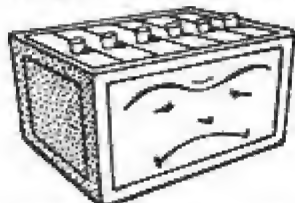
Short periods of loading are desirable. When engine is warmed up, drive at 25 m.p.h., then push down on accelerator until car speed is 50 m.p.h. Now release accelerator, letting car coast back to 25 m.p.h. Repeat several times. Consult your car manual for break-in schedule recommended by the manufacturer. Caution: Never accelerate a new or reconditioned engine from low (5 to 10 m.p.h.) speed with a wide-open throttle. This would cause overload without proper lubrication.

Drive for the first 200 miles at normal speeds up to 50 m.p.h. Avoid sustained high speeds. If traffic forces you to drive under 25, shift into low gear to maintain engine speed.



12-VOLT BATTERY CAUTION

In the familiar 6-volt battery, the anti freeze value of the electrolyte will protect the battery even when there is not enough power to start the engine. In a 12-volt



system, with its higher voltage and lower amperage, the battery will not stop cranking the engine until it is completely run down. In this condition the specific gravity will be so near to pure water that it will freeze just below 32° F.

Never allow a 12-volt battery to stand in a discharged condition in cold weather. Freezing will cause irreparable damage.

ASK FOR FREE HANDBOOK

"Care and Feeding of Engines" is an illustrated manual of engine care prepared to help you save money on car repairs. Your copy will be mailed on request. When you re-ring, be sure to use SEALED POWER KromeX Ring Sets for quick seating, immediate oil control, and long, long wear. Your dealer has them or can get them for you. Sealed Power, Dept. G-9, Muskegon, Mich.



Sealed Power

PISTON RINGS

(Continued from page 226)

you imply in your letter that you wish to use the longest lasting posts. Ordinarily this would mean that you should use posts cut either from black locust or Osage orange. One or the other is generally selected when the longest lasting wooden posts are desired. They are, however, rather difficult to obtain in some localities, especially the Osage orange, and both are rather expensive. The wood is very hard and does not take nails readily. When properly seasoned, posts cut from Osage orange are said to last from 20 to 35 years, their total life depending to some extent on local conditions. Black-locust posts should give you 20 years of service.

Wet Basement

Q—My home was built a little over a year ago in a new subdivision. There was difficulty keeping water out at the time the basement walls and floor were poured. Now water comes in along the walls where the floor joins. Also there are areas in my lawn that are continually wet even in dry weather. Lot is graded about 1½ ft. above the surrounding area. Both my builder and I are puzzled. What could be the cause?

—F. D., Ill.



A—You say you are in a new subdivision and for this reason we would suspect right away that the water is coming from a natural spring, a flowing well, or an old farm tile which somehow was plugged at the time the basement excavation was made. Any one of these could be the cause of the trouble you are experiencing. As a rule the remedy is not so simple. Sometimes it is possible to divert the flow of a well or spring into a drain tile where a suitable outlet is no problem. Of course, such a procedure is likely to be expensive, even though it is possible to reach an outlet within a comparatively short distance. If an old flowing well is the cause, it may be possible to locate it and pull the pipe. This may cause dispersal of the water at a lower level and end the trouble. If an old tile line has been broken and plugged by the basement excavation, it may be practical to locate the tile and reconnect it by carrying a new line around the basement wall. If this can be done, it is quite likely to effect a cure in solving your problem of water entering along the walls where the floor joins.

Lawn Clippings

Q—I have been told that late in the season lawn clippings should always be removed, that if left on the lawn after mowing clippings will tend to smother the grass the same as leaves and other trash. I have never quite understood why this should be so. Is there a good reason for removing the clippings each time the lawn is mowed?

—B. E., Kans.

A—If for some reason a heavy turf is left to grow to a height of 4 to 6 in. before mowing there may be some justification for removing the clippings, especially if mowing is done during warm, rainy weather when there is comparatively little sun and wind to "cure" the clippings quickly. Even then clippings should be saved and returned to the lawn, either by scattering uniformly as a mulch, or by composting with other materials and returning in the form of a top dressing. They should never be destroyed entirely, as clippings should always be a part of the lawn-fertilization program. If the newer rotary lawn mower is used, the clippings are chopped, or "recut," and mulching and distribution are carried out more or less automatically. Always keep the blades of a lawn mower sharp (this applies to both reel-type and rotary-type mowers) as otherwise the individual blades of grass will not be severed cleanly and actual damage to the lawn may result over a period of time if a dull mower is used.



ANNOUNCING

TRUE TEMPER'S NEW

JET ROCKET

Priced to
sell at
\$ **3.95**
No. B-16

HEAD WON'T LOOSEN

HANDLE WON'T BEND OR BREAK

Now, at the amazing low price of only \$3.95, you can get this wonderful new JET ROCKET hammer by True Temper. JET ROCKET is built like the famous ROCKET that continues to bring unsolicited letters of praise from craftsmen and do-it-yourselfers alike.

Handle is tubular steel made of a boron alloy especially developed by The Timken Roller Bearing Co. Won't bend or break. Permanently attached to streamlined head, carefully forged and heat-treated for strength. Head is highlighted with a distinctive jet-black finish. Comfortable grip soaks up shock. Won't slip wet or dry, or in gloved hand.

Try the JET ROCKET yourself. Swing it a few times. Notice its perfect balance and feel. Look for it at your favorite tool counter displayed with the famous original ROCKETS—the finest hammer made. True Temper Corporation, 1623 Euclid Avenue, Cleveland 15, Ohio.

TRUE TEMPER®



Finest quality in Hammers, axes, hatchets
Shears • Shovels • Garden, lawn and farm
tools • Fishing tackle • Golf-club shafts

SEPTEMBER 1956



"Imagine...

A GUY WITH A WRENCH CALLS MY PITCH!"

... says Johnny Podres, Brooklyn Dodger
Pitching Sensation

"When my regular serviceman, who really knows the score when it comes to automobiles, started pitching me the reasons why he put in new oil seals when I had the front wheels checked and repacked, I couldn't get a word in edgewise.

"Johnny, you don't risk a close decision when you can play it right and come in safe!" he says. "It's safer to inspect and repack the front wheels every 5,000 miles and it's more economical to replace the oil seals instead of re-using them. Of course, I used C/R oil seals—manufactured to the same rigid specifications as the oil seals installed at the factory."

"Hold it, hold it," I hollered, "I know all these things and I wanted C/R oil seals all the time."

"So why don't you take the signal from both of us ... have your mechanic put in new C/R oil seals after every wheel bearing, brake or engine repair job. It's always cheaper to replace oil seals than to re-use. Have him check front wheel bearings and oil seals every 5,000 miles. It's a sure way to avoid possible danger and expensive tube leaks."

GET THIS FREE TIP...

Write today for this important folder that tells why inspecting and repacking the wheel bearings every 5,000 miles provides economy and safety.



CHICAGO RAWHIDE MANUFACTURING COMPANY
REPLACEMENT DIVISION ELGIN, ILLINOIS



World's Largest
Manufacturer of Oil Seals
for original equipment...

**CHICAGO
RAWHIDE**

Tune-in MONITOR...
NBC's weekend radio
sensation... hear the
C/R oil seal story.

Owners Report on Continental Mark II

(Continued from page 151)

features with 33.2 percent including it.
"It requires less wear and tear to drive than any car I have ever owned. Most comfortable and soundproof automobile."—Kansas businessman.

"Handles like a small car in traffic and still is a big car on the open road."—Illinois farmer.

"We drove 763 miles in one 12-hour day and were less tired than on a 500-mile trip in previous cars."—California broker.

What Should Be Changed?

Although 32 percent of the owners say that nothing should be changed in the Mark II, there are others who have some suggestions for modifications:

"Make a short-coupled four-door model."—New York banker.

"Trunk should be eight inches longer."—Wisconsin businessman.

"It isn't easy for elderly persons to get in and out. Should have model designed for middle-aged executives and town use. Too expensive for anyone really young enough to enjoy it."—Alabama rancher.

"Rear seat is too crowded."—Michigan executive.

"Take the spare tire out of the trunk. There isn't enough room for it."—Missouri executive.

"Would prefer a convertible."—Florida housewife.

"Needs more brakes. Can't read small instruments quickly."—California retired owner.

"Should have electric windshield wipers."—Colorado retired owner.

More Best-Liked Features

The following quotations describe other best-liked features in order of frequency of mention. For information on the exact percentages of owners mentioning each turn to page 149.

"Smooth power. Same rate of acceleration from 60 to 80 as from 30 to 50."—Illinois insurance executive.

"I am a fast driver and have averaged better than 90 miles per hour on trips. Even at high speeds my family is comfortable."—Kansas investor.

"No sway on curves. Takes rough roads easily. Steering finest ever."—New York manufacturer.

"For a big car, road holding, cornering and steering are extraordinary. I want to emphasize that I have export springs on my car. I do think this makes a substantial

(Continued to page 232)

DISSTON

D-23 Lightweight, Straight-back

HAND SAW

CUTS CLEANLY!

CUTS SMOOTHLY!

**ONLY
\$895**

**CUTS FOR A
LIFETIME!**

10-to 12-pt. Disstons recommended for smoothest cuts in plywood and other well-seasoned woods

When you're cutting plywood and want a beautifully smooth finished edge, you've got to use a saw that's made for finished work.

That's a 10-, 11-, or 12-point Disston. These fine-toothed saws often make the difference between fine workmanship and an ordinary job. They are specifically designed to be used for finishing.

So if you've been trying to cut plywood or other well-seasoned woods with an 8-point saw, ask at your hardware or tool store for a Disston D-23 in 10-, 11-, or 12-point. You'll get a saw of fine tool steel, with perfectly tempered and double taper ground blade . . . a saw you'll use and treasure for a lifetime.

CARLSON STEEL TAPE RULES AND TAPES



WHITE CHIEF
(6 ft.) \$1.80

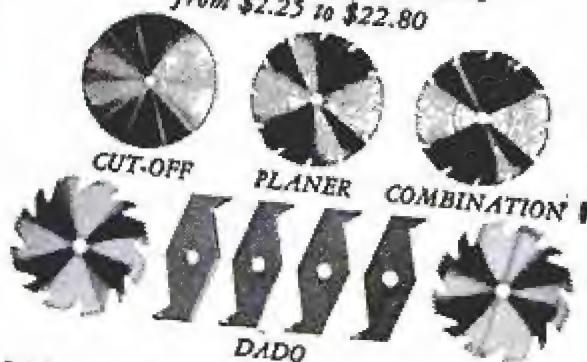
BIG CHIEF
(12 ft.) \$3.50

STAR CHIEF
(50 ft.) \$5.00

Finest quality long tapes and pocket-size rules for every purpose. From 6 feet to 100 feet. Accurate, easy-to-read. Double graduations, feet and inches. Stiff, rigid, easily-changed blades. Easy-action swing tips.

FREE ILLUSTRATED BOOKLET! 64-page Disston Saw, Tool & File Manual. Tells how to choose and use tools; how to care for them. Helpful hints on wood working, metal working and selection of materials. Write today for your free copy.

DISSTON DE LUXE CIRCULAR SAWS AND DADOS from \$2.25 to \$22.80



Make cutting easy and accurate. Made of famous Disston steel. High finish; keen teeth; accurate fitting. Special styles to fit all makes of bench and portable electric hand saws.

**ASK YOUR HARDWAREMAN
TO SHOW YOU THESE FINE DISSTON TOOLS**

DISSTON

Henry DISSTON DIVISION • H. K. PORTER COMPANY, INC.
911 Tacony, Philadelphia 35, Pa.



WILLARD

BATTERIES



LAST LONGER
BECAUSE THEY'RE
BUILT BETTER!

Willard batteries are
guaranteed by competent
battery dealers in your
neighborhood.

improvement in its handling qualities over standard springs. It's the first quality American car since the Crane Simplex."—Massachusetts investment advisor.

"Silent, noiseless operation. With all windows closed, fresh air through air intakes and air conditioner keeps car exceptionally clean and quiet."—California designer.

"Fine workmanship throughout."—New Hampshire plant manager.

"Interior dignity. Dashboard is simple, like a good clock."—Pennsylvania artist.

"Absence of 'boudoir effect' present in all other cars."—Florida businessman.

"Low center of gravity gives feeling of safety."—New York retired owner.

"To be honest, I like the attraction it has for others. Also the prestige."—Ohio contractor.

"I like it because it is a car apart from them all. Something very few persons have."—Michigan sales manager.

"Long hood is restful on the eyes on long drives. The modern stump hood tires the eyes with the 'on rush' of the too-close view of the road."—California architect.

And More Complaints

Here are quotations describing other complaints of owners, in order of frequency of mention:

"Water leaks at top of door glass."—Minnesota owner.

"If I carried back-seat passengers any distance, there wouldn't be enough room for comfort."—California administrator.

"Not enough headroom in back seat. Head strikes top at slightest bump."—California retired owner.

"Window lifts went out of order."—Indiana industrialist.

"Frankly disappointed with small details: Inoperative window lifts, ash-tray location, door rattles, interior gasoline odor. But to love this automobile is easy. Take it out on the highway and these minor aches are cured."—California manufacturer.

"Biggest complaint is that advertisements lead one to believe extreme care would be taken in manufacturing the car. Car was delivered with many body noises which were difficult to fix. Seat padding was poorly done. Had leaks in doors and trouble with the electric windows."—New York businessman.

"Advertising is grossly exaggerated. Obviously the car does not go through the many checks the factory would lead you to believe, or those performing these checks are not very capable personnel."—California dentist.

"Inadequate brakes for power and weight."—Illinois designer.

(Continued to page 234)

MEN WITH MECHANICAL SKILLS:



CAN YOU MEET THIS CHALLENGE?



Mechanics Creed

Upon my honor I swear that I shall hold in sacred trust the rights and privileges conferred upon me as a certified mechanic. Knowing full well that the safety and lives of others are dependent upon my skill and judgment, I shall never knowingly subject others to risks which I would not be willing to assume for myself, or for those dear to me.

In discharging this trust, I pledge myself never to undertake work or approve work which I believe to be beyond the limits of my knowledge; nor shall I allow any superior to persuade me to approve aircraft or equipment as airworthy against my better judgment; nor shall I permit my judgment to be influenced by money or other personal gain; nor shall I pass as airworthy aircraft or equipment about which I am in doubt, either as a result of direct inspection or uncertainty regarding the ability of others who have worked on it to accomplish their work satisfactorily.

I realize the grave responsibility which is mine as a certified mechanic to exercise my judgment on the airworthiness of aircraft and equipment. I, therefore, pledge unyielding adherence to these precepts for the advancement of aviation and for the dignity of my vocation.

If you are a man who takes real pride in a job well done, the Air Force offers you a challenging and rewarding career. The safety of our country, and the lives of its defenders, depend on your accuracy and devotion to duty. Act today and put your skills to work tomorrow—in the U. S. Air Force.

GO PLACES FASTER ON
THE ALL VOLUNTEER
TEAM

THE U.S. AIR FORCE

PASTE COUPON ON POSTCARD

And Mail To

M-40-PM3

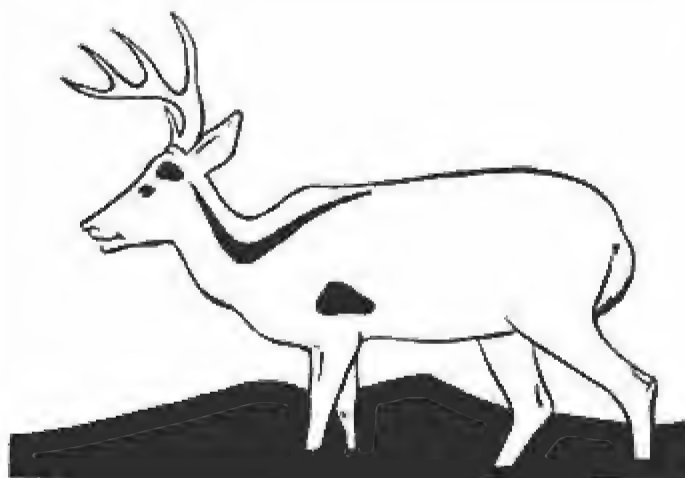
Airman Recruiting Information Branch
Box 2202
Wright-Patterson AFB, Ohio

Please send more information on my opportunities for enlisting in the U. S. Air Force. I am between the ages of 17-34 and reside in U.S.A. or possessions.

Name _____

Address _____ Age _____

City _____ Zone _____ State _____



FOR CLEAN KILLS— MICRO-GROOVE ACCURACY

Now all Marlin high-powers have Micro-Groove Rifling*, to give you a 20-25% advantage in accuracy. Vital spots are often no bigger than your hand—so this extreme accuracy pays off every time!

With Micro-Groove Rifling heading Marlin's list of exclusive, game-getting features, the famous, fast-firing 336 is this year's most talked-about, most popular deer rifle!

See this modern rifle at your dealer's. In 30/30 or .35 Rem. calibers, its sharp-shooting accuracy will bring you more game with fewer second shots!

Here are 3 other reasons why the 336 is the outstanding choice for '56:

- 1 New Type Round Breech Bolt. The strongest and smoothest of lever actions!
- 2 Jam-Proof Feeding—Positive Extraction. The round breech bolt offers unmatched dependability!
- 3 Lowest 'Scope Mounting. Side ejection allows lowest mounting of all, for easiest, surest aiming!

Model 336-30/30 Regular Carbine.
\$72.95** without 'scope.

*Patent applied for. **Slightly higher west of the Rockies. Subject to change without notice.

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FINE GUNS SINCE 1870

MARLIN FIREARMS COMPANY, New Haven, Conn., Dept. PM-96

Please send me your catalog with photo-illustrations and complete descriptions of all Marlin Guns. Also send me a pack of (check preference) () single- or () double-edge Marlin Razor Blades. I enclose 10¢ for handling.

Name.....

Street.....

City.....Zone.....State.....

"Ash tray for driver hard to use because steering wheel too close to door."—Mississippi physician.

"Brakes grab unevenly when hot and fade."—New Jersey industrialist.

"Doors too massive."—Iowa store owner.

"Paint is beautiful (mine is black) but requires much care and can be washed only by trained people."—Oklahoma housewife.

"Car is chauffeur-driven and washed. Paint is soft and difficult to wash without streaking."—Ohio housewife.

"Paint job was so poor the dealer repainted it."—Nevada club owner.

"Tires are not top quality one would expect on this price car."—Wisconsin retired owner.

"Lack of springing in center of seats makes a third passenger, front or rear, uncomfortable. Strictly a four-passenger (or less) car."—California physician.

"Carpet too thick. Difficult to keep clean."—Louisiana oil operator.

"Back of right front seat hits dash when seat is forward."—California physician.

"Don't like imitation spoke wheel disks instead of actual spoke wheels. Very cheap for a \$10,000 car."—Maryland inventor.

"Turn-signal indicator lights on dash should be larger."—California lumberman.

"Our only disappointment is a feeling that as Continental owners we have not received personal attention or contact from the manufacturer. Such personal interest would give us an even greater pride of possession."—California entertainer.

"My chief worry is that newer models of the Mark II may have such mechanical innovations as fuel injection or air suspension. Mechanically, it is a very ordinary car."—Arizona executive.

"I ordered the car air conditioned. When delivered, there was no air conditioning on it. I was told by the dealer (I am sure he did not know any better) that air conditioning would be added later. I have since learned (and so has the dealer) that cars that were not delivered with air conditioning could not be air conditioned under factory specifications. There are differences in the body for air-conditioned models."—Tennessee executive.

"My answers to questions are on the second of two Mark IIs I have had. The first, being a complete 'lemon' in all respects was replaced by the dealer, which I consider an outstanding and unusual service."—Virginia financier.

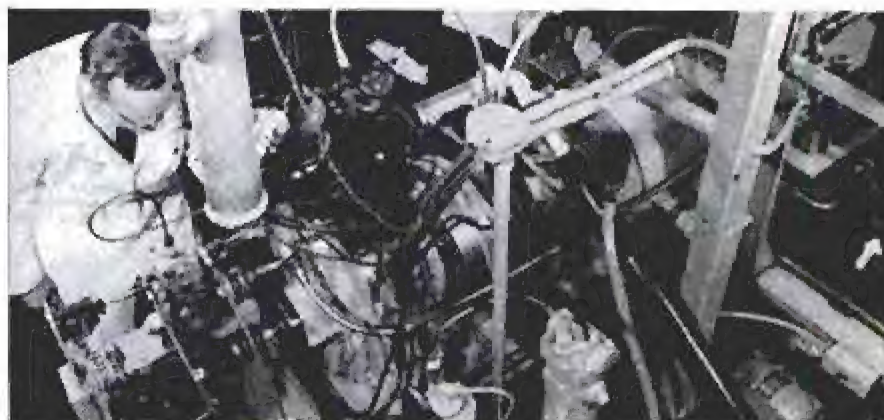
And finally here are the finest testimonials any car can get:

"I like this car so well, I bought another two months later. Driving this car spoils you for any other make."—Illinois inventor.

(Continued to page 236)

These tests proved **POWER TIP** best for today's overhead-valve V-8 engines

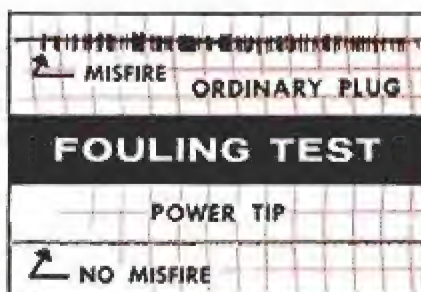
Five years of laboratory and road testing research preceded the announcement of the Auto-Lite Resistor Spark Plug with Power Tip. Here's actual proof showing how this new development in ignition-engineering fires up your engine for top performance and economy at all speeds.



THIS TEST ENGINE, standard testing device used throughout industry, can subject spark plugs to worse conditions than they'll ever meet in your car. In pre-ignition test above, engine power output is increased until spark plug insulator tip becomes hot enough to ignite fuel mixture (pre-ignition). Test proved Power Tip has greater safety factor against pre-ignition than conventional spark plug with shorter insulator tip.



POWER TEST. Late model V-8 engine is operated at wide-open throttle with conventional spark plugs, then with Auto-Lite Resistor Spark Plugs with Power Tip. Standard carburetion and ignition components were used with manufacturer's recommended timing. New Power Tip actually showed better power output and performance than other new conventional plugs at all speeds.



FOULING TEST. Above are recordings taken from test equipment set up to show how spark plug fouling causes misfiring. Both conventional spark plugs and Power Tip were run through same fouling test. Upper chart shows serious *misfiring* recorded during test with ordinary plug. In identical test, lower chart shows new Power Tip continued to operate perfectly with *no misfiring*.



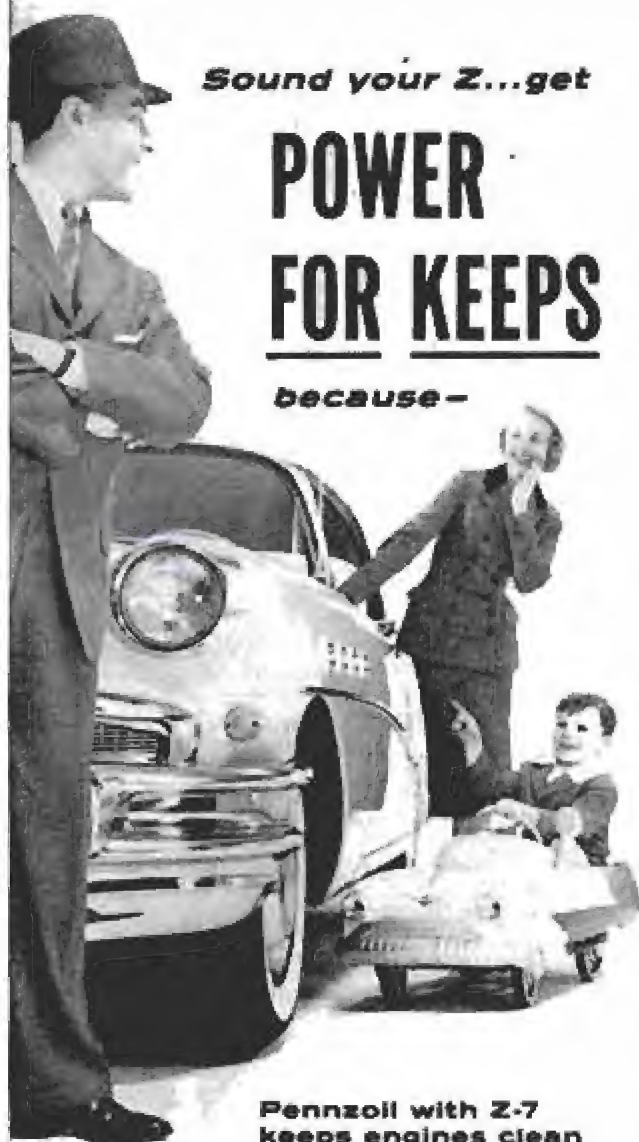
ROAD TEST. The "acid" test of any automotive part. The Auto-Lite Resistor Spark Plug with Power Tip was tested in 17 makes of new cars in cross-country runs with cars traveling thousands of miles—under both city and highway driving conditions. In these test cars, new Power Tip completely confirmed every laboratory test! No doubt about it—only new Power Tip "fires up" engines at all speeds.

POWER TIP FITS and has been tested in all these makes of cars with overhead-valve V-8 engines using 14 mm spark plugs: Chevrolet • Chrysler Buick • Cadillac • DeSoto • Dodge • Plymouth • Ford • Hudson • Imperial Lincoln • Mercury • Nash • Oldsmobile • Packard • Pontiac • Studebaker

AUTO-LITE RESISTOR SPARK PLUG WITH **POWER TIP**



Auto-Lite manufactures over 400 products, including Spark Plugs, Batteries, Wire and Cable and Automotive Electrical Systems . . . sold throughout the United States and Canada.



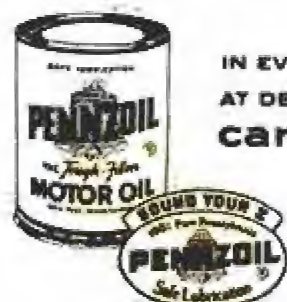
Sound your Z...get

POWER FOR KEEPS

because -

**Pennzoil with Z-7
keeps engines clean**

Pennzoil with Z-7 is The Tough-Film® oil with an all-oil lubricating body. It stays tough under engine heat and pressures, prevents build-up of power-stealing deposits. By keeping engines clean, this different Pennsylvania motor oil controls carbon completely. There's no knock, no ping. Horsepower stays unlocked—not for just a few miles after an oil change, but for keeps. To enjoy all the smooth power you bought, get Pennzoil with Z-7 now in the exact seasonal grade for your car!



IN EVERY STATE,
AT DEALERS WHO
CARE FOR YOUR CAR

MEMBER PENN. GRADE CRUDE OIL ASSN., PERMIT NO. 2, OIL CITY, PA.

"I like everything about it. I have induced my sister and two brothers each to buy a Continental. I am about to purchase an additional Mark II for my wife."—New Jersey financier.

Most of us will never own a Continental Mark II, but now we know what it's like to own one. These owners tell the whole story, the good and the bad.

For a veteran driver's impressions of the car turn to Floyd Clymer's story on page 147. An engineer, Dale Kelly, gives his findings on page 148. ★ ★ ★

Clymer Drives the Mark II

(Continued from page 147)

not unlike the Thunderbird, although it has much softer front springing. It has the solid feel of a heavy car and drives somewhat like the heavy quality cars of the twenties. The comparatively short wheelbase (126 inches) for a car of its weight contributes to its excellent cornering ability and handling over winding roads. There is only slight roll on corners and the body remains quite flat. Roadability is excellent. Ride is comfortable and luxurious.

It is the heaviest of American cars, its shipping weight being 5190 pounds with air conditioning. Due to the low roof (56 inches from the ground) the car appears wider than its 77.5 inches. Actually, there are five or six wider cars on the market this year.

Top speed at Rosamond Dry Lake by speedometer was 118 miles per hour, proving the Mark II is far from a slow car. At 60 miles per hour I found the speedometer fast by only 4 percent which is more nearly accurate than most speedometers. The Continental is in no sense a hot rod. It is not the fastest American car. Obviously a Continental buyer is not the hot-rod type and few purchasers will want to drive the car wide open for a very long distance. Acceleration is satisfactory, but not sensational.

Considerable pressure is required on the steering wheel. It doesn't steer as easily as many power-steered cars. The wheel is small (17 inches) and the over-all ratio is 20.9 to 1. Steering should be slightly faster. Turning diameter, curb to curb, is 45.3 feet.

Only light brake-pedal-pressure is needed for application of the power brakes which are smooth and effective, although at extreme high speeds when slowing for sharp corners there was some fade—not unusual for such a heavy car.

The horsepower has never been listed by the makers and, when officials were asked, they said, "It is more than adequate for top performance." Perhaps this is their way of gracefully getting out of the horsepower

(Continued to page 238)

STANLEY STEELMASTER

The Finest Hammer Ever Made

Driving nails is work — no doubt about it. But it's also the kind of clean, thumping exercise a man can enjoy. There's smacking satisfaction in belting a shiny tenpenny into stout 2 x 4 studding. This is the hammer to use . . . for accuracy, authority and pleasure . . . it's the Stanley STEELMASTER, the finest hammer ever made.

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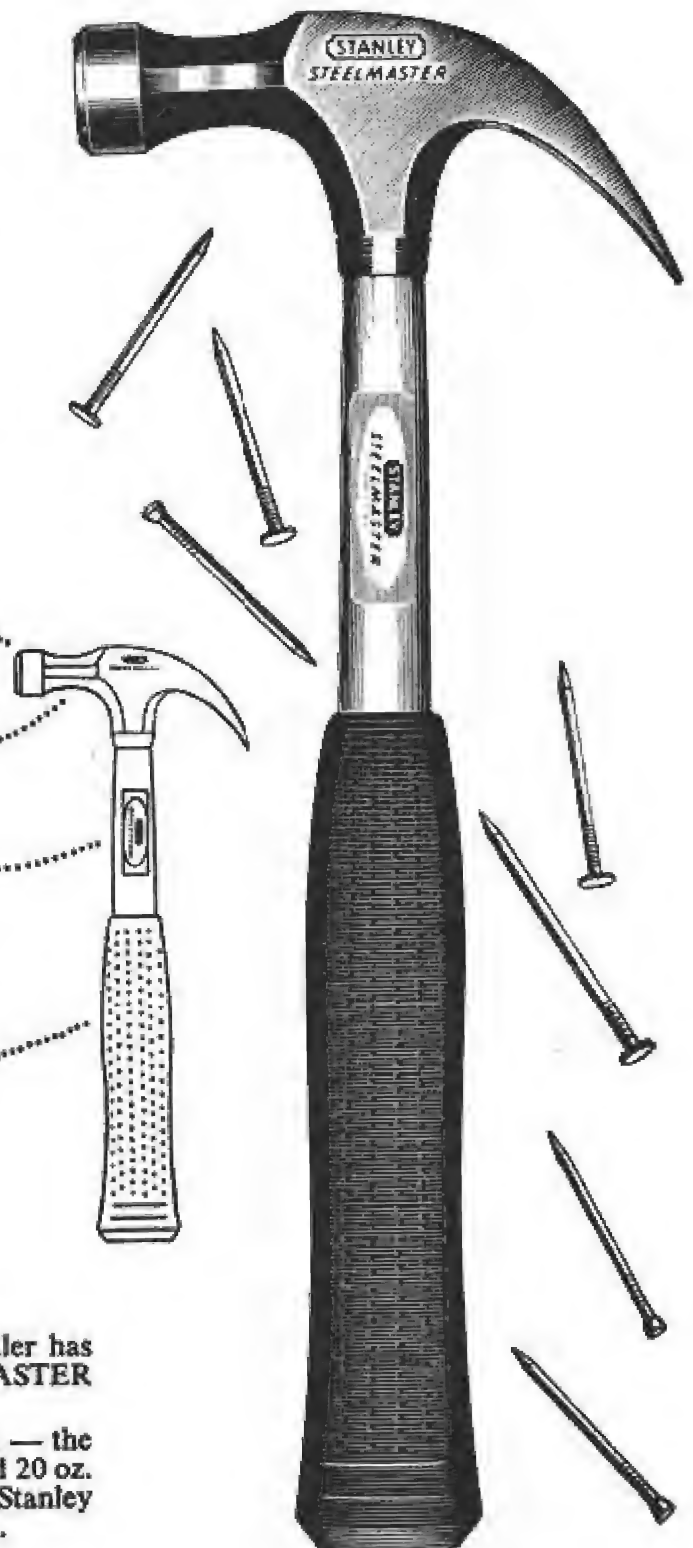
Exclusive! Rim of striking face is induction tempered to minimize chipping.

LOCKED-ON HEAD — The head is permanently locked to the handle; it will never come loose.

CHROME ALLOY HANDLE — Special chrome alloy steel handle *will not break!* It flexes a little, it absorbs vibration, but it will not break. Chrome plating prevents rust.

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race controversy, and maybe it is just as well, as power is ample.

At extreme high speeds I found very little wind noise or body rumble. Only on rough roads at quite high speeds was there any noticeable hood flutter, in spite of the fact that the hood is very long (70 inches from windshield bottom to front). The long hood gives a massive appearance from behind the wheel.

The automatic transmission is the best and smoothest I have ever found in any car. It is a torque converter with three gears. The gear changes take place smoothly at various speeds, depending on throttle opening. If the throttle is pushed to the floorboard, the first upshift takes place at 50 miles per hour, or between 30 and 40 miles per hour with partial throttle opening. The second upshift takes place from 40 to 50 miles per hour, on partial-open throttle. If the throttle is held wide open, top upshift takes place at 75 to 78 miles per hour. Downshift at any speed up to 75 miles per hour can be made by floorboarding the throttle and I consider this an excellent feature. Downshift on most cars built today takes place only at speeds below 60 or 65 and many times downshifting is desirable above these speeds.

Interior design and appointments are excellent. The deep-grained leathers immediately catch the eye as being rich in quality. The deep-pile carpets are easily removed for cleaning. Straps on the back of the front seats serve as robe rails or handholds for rear-seat passengers. The Mark II is a fully equipped car. Only air conditioning is optional equipment.

The driver's control panel, located in the armrest of the left door, provides control of every window (even the window vents are power-operated), and of the adjustment of the front seat.

The seating position is excellent. Foam-rubber cushions give lounge-chair comfort. The upholstery is of the highest quality with good springing. The full-length armrests, with their foam-rubber cushions, contribute greatly to passenger comfort. A center armrest may be pulled down from the back of the rear seat into position between its occupants.


The wide, pendulum-type foot brake is better located in relation to the throttle than on any car I have driven, as both pedals are at about equal distance from the floorboard.

The speedometer is directly in front of the driver, with no upper half of the horn ring to obstruct vision. I like the trip-mileage indicator, which can be easily reset by a knob. Instruments are well shrouded to

(Continued to page 240)

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kill sun glare or reflection in night driving. I approve of the needle gauges for oil pressure and amperes. These are small and neatly housed under a circular dial which also includes temperature and fuel gauges. There is an excellent, electric clock with a sweep second hand. A tachometer (calibrated to 5000 revolutions per minute) indicates engine speed in terms of revolutions per minute. It is fascinating to drive by "tach," which is usually found only in sports and racing cars. In checking the tachometer we found true speeds as follows: At 40—1500 r.p.m.; at 50—1900 r.p.m.; at 60—2250 r.p.m.

The radio is the best I have found in any car. Signal-seeking, two-bar controls for town or country tuning are standard.

The glove compartment is quite large and is the "drop down" type, which ordinarily I don't like, but Continental has boxed in the sides to prevent articles from falling out when the door drops.

There are foot "wells" front and rear, which make a step-down feature. A larger-than-usual center hump covers the transmission and driveshaft.

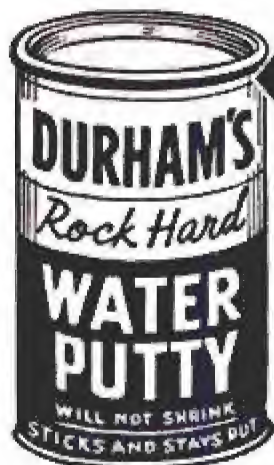
Directly in the center above the floorboard hump are levers controlling fresh air, heater, and air conditioning. The ventilating system is perfect. There are four independent outlets, with one master control, each regulating the flow of hot or cold air along either side of the passenger compartment. Two other openings are on each side of the body, with a flow of air directed to the feet of the front-seat occupants. The air for the rear-seat passengers flows through ducts in the base of the doors.

During an extremely hot day (106 degrees) in the San Joaquin Valley near Fresno I found the air conditioning unit to be of high quality in every respect. Even on low blower, the cold, fresh and filtered air was ample. One lever controls the entry of the cool air—certainly the most simple of all air conditioners to operate. There are four circular air outlets in the roof of the car, located somewhat like the overhead outlets in airplanes.

The hand brake is on the left side and its operation would be smoother if a pivoted bracket for the handle shaft were used. The handle, in off position, is too far forward for the average driver.

Front and side vision is good. However, Continental's styling does not allow as large a rear window as in conventional cars. The three-quarter rear vision therefore is not as great as in other cars, in view of the rather wide upper portion of the body between the side and rear windows. I found the body to be tight and, in rather

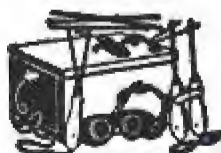
(Continued to page 242)



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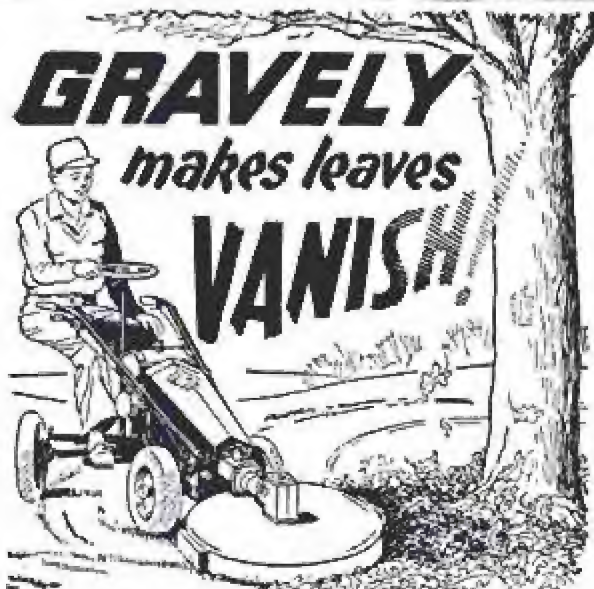
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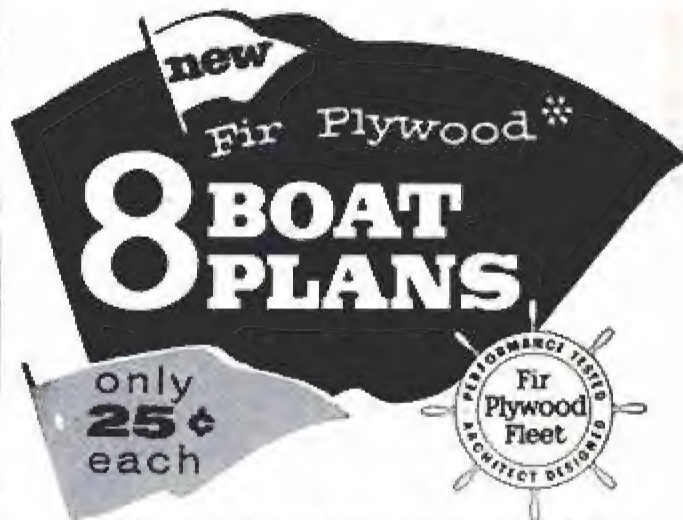
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severe tests, no dust or water leaked inside the body.

The doors are large and heavy, which adds to the solid "feel" of the body, even though they are a little hard to swing open because of their weight. Fortunately, there is a door "stop" when the door is opened fully, or half way—highly desirable with such heavy doors.

The front bumper is narrower than on most cars, and slightly V-shaped, protruding some in front center. Parking lights mounted within the front bumper ends are well protected.

Dual exhaust outlets are mounted within the rear bumper, which now seems to be common—although the dirt which usually accumulates on both sides of the rear bumper as a result is a bit of a hazard to one's clothing when walking around the rear of the car.

The gas-tank filler cap is neatly covered in the left rear taillight assembly. The taillight slides sideways to uncover the cap. This arrangement is a good one even though its operation puzzled most service-station attendants. Few knew how to locate the filler cap. One of the finest features is the 25-gallon-capacity gas tank. I have long advocated the use of larger gas tanks for high-powered cars. Continental's tank capacity is the answer to the prayer of the long-distance driver. After my trip from Los Angeles to Fresno (218 miles) the fuel tank registered nearly half full, which was a pleasant surprise. In spite of this large-capacity tank, there is a warning arrow which lights up on the dash when the fuel supply drops to three gallons.

I have never driven an American car that attracts more attention than the Continental. Most people accept it as high quality and seem to know that it is America's highest-priced car. Undoubtedly every Mark II owner has a certain pride of ownership in this quality car, with a minimum of chrome and a simple styling. I found no squeaks or rattles. The factory manual states that no break-in period is necessary, and that the owner may drive the car as he pleases from the beginning (a procedure I've long advocated in breaking in any modern American car).

I have heard very few complaints with the Continental Mark II and, quite frankly, it is a much better car than I expected. In every detail, large or small, quality sticks out all over, even to the excellent instruction manual and the personalized Continental nameplate attached to the floor-board center. In my opinion, it is the finest and most carefully made motorcar manufactured in this country—and well it should be, at its price. ★ ★ ★

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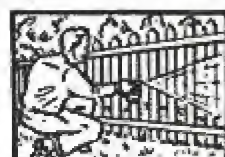
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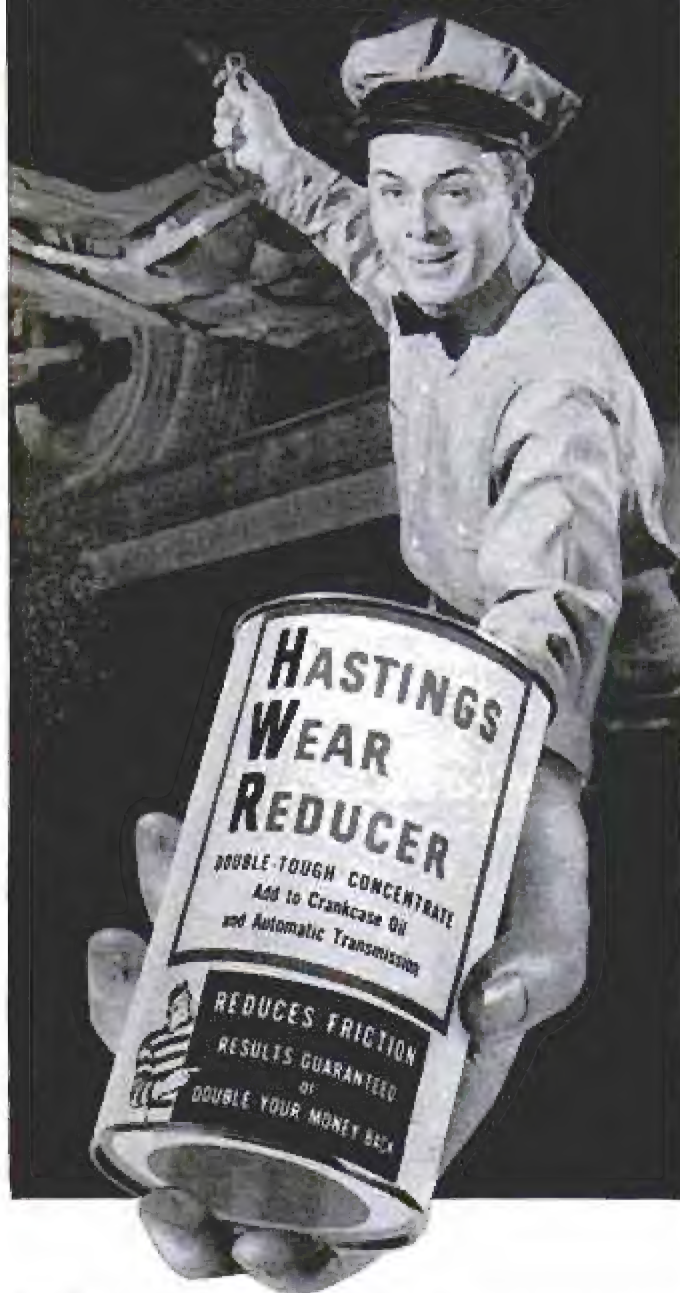
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Taken in a special summer school for children of migrant workers, this was shot at f:2.8 and 1/50

Indoor Pictures Without Flash

(Continued from page 136)

lamps and you'll get good results. However, most professional photographers, who do their own developing, consider such ratings to be very much on the conservative side, with a safety factor of at least $2\frac{1}{2}$ times, and will often use ratings of from 320 to 800.

This large safety factor is designed to cover such variables as performance of equipment or errors in judgment. Experi-

(Continued to page 246)

Boxing picture in available light. Exposure was 1/250, f:3.5. Developed in Promicrol for 14 minutes



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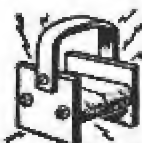
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enced photographers can eliminate the necessity for the safety factor by controlling conditions. The exact speed index used depends on such things as the developer used, shutter accuracy, the photographer's personal opinion about negative quality, the type of enlarger to be used and the lighting conditions.

(Note: All emulsion-speed values referred to here are ASA exposure indexes. Users of Weston-index meters can translate effective ASA speeds into Weston numbers by remembering that any Weston index is approximately four-fifths of an ASA index. For example, a Weston reading of 160 is about the same as an ASA reading of 200.)

Experiment With Tri-X

The photographer just beginning to use Tri-X would best start with the recommended index of 200 set in his meter. A few experimental shots will show him how he can utilize Tri-X's wide latitude and high sensitivity for his own use. A good general rule to follow is that the new films give best results when exposure is just adequate to give detail in the darkest area of the picture.

When the high-exposure indexes are used, developing is an important factor, and each photographer is well advised to do his own film processing. Modern mass-production processing is adjusted to give the widest range of printable negatives—considering that every film on the market from persons who make every conceivable error in exposure must be processed.

Develop It Yourself

But film development is easy to learn, and kits containing everything needed are available at photo-supply stores. As a guide for handling Tri-X in the darkroom, the chart on page 136 is included. This indicates time of development of the film in four different developers to obtain a negative which will make a reasonably grain-free enlargement on normal No. 2 contrast paper. The chart is not intended as an infallible guide, but should be used as a basis for the first trials with Tri-X, until experience takes over.

Each of the developers listed is good, and each has its advantages and disadvantages. D-23 gives a medium-fine grain pattern, and is extremely popular because of its tolerance toward overexposed highlight areas, which it will seldom blacken to the point where they become unprintable. D-76 produces a homogeneous medium-fine grain pattern, within the range of indicated development times, but probably should

(Continued to page 248)

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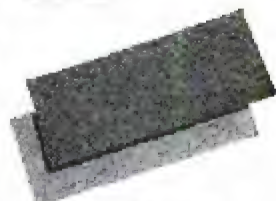
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not be used for more than 15 or 16 minutes on Tri-X, since after this the grain rapidly becomes excessive. D-76 yields the sharpest image of any developer.

Promicrol is much like D-76, except that it is somewhat finer grained and has less tendency to block up highlight areas. Microphen yields a mottled, indistinct grain pattern similar to, but finer than, that of D-23. Microphen should never be used for less than 10 minutes, as it requires this much immersion time to achieve good contrast with Tri-X. Microphen has the least tendency to block up highlight areas of all four developers mentioned.

One interesting technique used by press photographers when they have had to shoot without flash in courtrooms, hospitals and other poorly lighted areas is to develop the Tri-X in Dektol developer for three to five minutes with constant agitation. These negatives will show grain, so it is best to restrict this last-ditch approach to roll-film and film-pack sizes where enlargements of no great size will be required. Shoot an experimental roll to find out whether or not you can use this method in a given situation.

The total effect of this revolution in photography we've been talking about can be summed up like this: The two-to-one difference in speed between the new films and their fastest predecessors has made a gigantic difference between what photographers could do before and what they can do now. ★ ★ ★

Dummy Aircraft Fool Observers

Air Force camouflage experts have developed dummy aircraft, inflated like balloons, to fool enemy observers flying over airfields on which they are placed. The decoy planes would serve to divert enemy bombs and gunfire and deceive the enemy as to Air Force strength and disposition. In tests with mock F-86F and F-84F jet fighters, aerial observers were unable to detect the difference between the accurate models and real planes, and all but two of 14 interpreters who examined 5000-foot aerial reconnaissance photos were unable to spot the decoys. The prefabricated, partially pneumatic F-86F decoy has a fuselage of two-ply rubberized balloon cloth and wings and tail of rigid ribbed sections covered with one-ply rubberized fabric. The F-84F is entirely pneumatic except for the tail. Decoys of other planes will be constructed.

☐ The United States has approximately 312,000 registered civil pilots and 99,000 registered civil aircraft.



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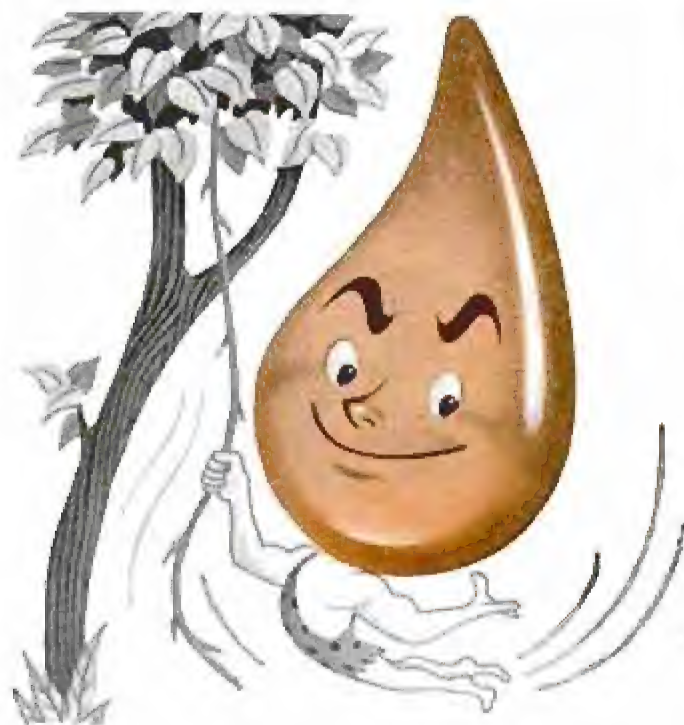
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PENNSYLVANIA GRADE CRUDE OIL ASSOCIATION • Oil City, Pa.

Better Fishing Ahead!

(Continued from page 127)

At a lake not far from Alma, the mine-acid problem arose again and was solved by the installation of a limestone-rock filter at the source of the trouble.

By midsummer in many of the more fertile, shallow lakes, aquatic vegetation becomes so thick and lush that fishing is impossible and it is even difficult to get a boat through it. A solution came from Wildlifer Frank Allen, who invented a number of underwater weed cutters.

Working with scrap materials and using cutter bars from old farm mowers, Allen produced one model, still in use, that is jet-propelled and can cut twenty acres of thick weeds per day. Most recent of his inventions is a portable model weighing less than 100 pounds which will fit almost any rowboat—and which can open more than 1000 acres of choice fishing water to the anglers each season.

Ohio's biologists are always looking for new species of fish that can be introduced into state waters—or even hybrids of native fishes that now exist in limited areas and can do well in other lakes in the state.

Muskie Planting Successful

The biologists have enjoyed amazing results with muskies in their planting program. In giant Rocky Fork Lake, inch-long muskies from stock seined in another part of the state grew to three feet and eight pounds in just two years.

Encouraged by this success, biologists are now planning to stock them in other places—to provide a new, exciting game fish and in the hopes that, with their voracious appetites, the muskies will keep the panfish under control and eliminate the need for poisoning.

Biologists and anglers everywhere have always wondered how many fish were in the water all around them. Now, with an electric shocking device, the fish population in all the streams of the state can be inventoried easily. A three or four-man crew can stun all the fish in one section of a creek and count them as they rise to the surface. The stunned fish are netted and the undesirables are removed. The game fish are then counted, sometimes tagged, and returned to the water alive and unharmed.

Tagging fish (on the lower jaw or on the gill cover) with metal tags is an especially useful activity of biologists. Tags that are returned or retrieved in future inventories, reveal how far fish travel and how fast they grow. This information is vital to the men working for better fishing in Ohio—and everywhere.

★ ★ ★

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You can't buy sandpaper in your living room. So when you're stocking up on paints, thinners, brushes and tools, make sure you haven't forgotten sandpaper. It's mighty important to a good job.

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WORLD'S LARGEST RECIPROCATING MOTOR MAKERS

There's Atomic Energy in Granite: Can We Unlock It?

(Continued from page 156)

he gets a high count from a body of granite or decomposed granite. He's sure he has made a rich strike. Sometimes it is hard to convince him that granite is virtually worthless at present, even though it is a storehouse that we will tap in the future.

Monazite, the chief commercial source of thorium today, is mined as a beach sand on the coasts of India and Brazil. It is also found as a beach sand in Russia and Australia. Smaller quantities of monazite sand occur on the coasts of Florida and Oregon. Other sources of thorium are in the rare earth deposits of Idaho, South Carolina and California.

In the past thorium was used chiefly in the manufacture of mantles for gas lamps of the Welsbach type. Today the Atomic Energy Commission is buying small amounts, paying about \$4 per pound for a product containing at least 50 percent thorium oxide. After reducing this to a metal, the AEC offers it for use in experimental reactors at a price of around \$19 per pound. Until recently the thorium was refined into metal by an expensive batch process that required costly reagents. Now a semicontinuous process, much less expensive, has been worked out.

Thorium is not readily fissionable. It does not maintain a chain reaction as do U-235 and plutonium. It is a raw material for atomic energy, rather than being an atomic fuel in itself.

When bombarded by neutrons, thorium changes into uranium 233, and U-233 can maintain a chain reaction. This explains the importance of thorium.

Thorium is to be used in experimental "breeder" reactors that are intended to produce power and at the same time to create as much nuclear fuel as they consume. In theory, a breeder can produce as much as 115 percent of the fuel it burns up, though this may not prove true in practice. Even if a breeder reactor produces almost as much fuel as it consumes, instead of more fuel, it still represents a big step in the development of energy.

Such a breeder would have a central core in which U-235 or some other atomic fuel is burned. The thorium will be placed like a blanket around the core so that it captures some of the neutrons that the core emits. The U-233 that is thus created from the thorium in turn will emit more neutrons, transmuting additional thorium. The theory is that a breeder reactor will

(Continued on page 254)

For your Ford - always specify the oil filter with the
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maintain itself as long as new supplies of thorium are fed to it.

It may be that thorium reactors can operate at higher temperatures than are permissible with other kinds. The resulting increase in efficiency would produce more steam.

This summer a sodium-graphite reactor using enriched U-238 was being completed near Los Angeles by Atomics International, a division of North American Aviation. Heat from the reactor will create steam that will drive a turboelectric generator which in turn will furnish 7500 kilowatts of power to local lines of the Southern California Edison Company.

The thermal efficiency of the reactor is rated at 30 percent, but if it were of the thorium type its efficiency would be around 33 percent. This seemingly slight increase in efficiency would boost steam temperature from the present 825 degrees to as much as 950 degrees, with an appreciable increase in electrical output.

Important experiments concerned with "thorium breeding" will be conducted in the sodium-graphite reactor at the same time that it is producing commercial power.

Eventually, thorium may become the favored raw material for fueling all large central atomic-power stations. This may not happen for some time, especially in the United States where rather large quantities of the uranium isotope 238 are on hand.

For every pound of fissionable U-235 that is refined, more than 200 pounds of U-238 are automatically obtained. This isotope can be converted into plutonium by bombardment, and plutonium can be used as a nuclear fuel. Too, U-238 that is enriched with U-235 is an acceptable atomic fuel.

Neither of these fuels possesses the breeding characteristics of thorium but from an economic standpoint it may be cheapest to use them. When the AEC released 88,000 pounds of U-235 for power development purposes here and abroad this past spring, it immediately became apparent that we have a vast surplus of useful U-238 on hand. A stockpile of more than 6000 tons of U-238 was obtained when the 88,000 pounds of U-235 were refined.

Another reason why we may be slow in building numerous thorium reactors is that we don't possess rich deposits of thorium. On the other hand, India is greatly interested in using thorium for power because of the deposits of thorium it possesses.

The usual tendency in any mining operation is to work the richest deposit first. Another tendency is to extract only one or two of the most valuable ingredients from an ore and literally to throw all the rest

(Continued to page 256)

IDEAS FROM WELDWOOD

THIS MONTH'S PROJECT—DESK-SEWING TABLE



Here is one of the most versatile, easy-to-build pieces of furniture you can have in your home. First, it's a desk—durable and steady for tots' or teens' homework. Then, it's a sewing table too—with a hinged top that swings out to form a generous 4' x 6' work area for cutting out patterns. (When not used for sewing, it can be wheeled back against the wall.) And the drawers and doors make it a spacious storage cabinet. For Easi-Bild® Plan, see coupon.

This Month's Hints

Installing curtain or drapery rods?

You can avoid drilling into plaster or masonry by following this method. First, make sure your plaster is perfectly sound. Next, take two pieces of plywood—about 2" square and $\frac{3}{4}$ " thick—drill or nail curtain rod braces and holders to the pieces of plywood. Coat one side of each with Weldwood Contact Cement. Next apply Contact Cement to wall at top corners of the window. Press the blocks to the cemented wall areas and they will be in place permanently. E. W.—Arlington, Virginia.

\$10 for your ideas

for "This Month's Hints," if accepted for publication. (Hints must apply to some Weldwood product.) Send them to Weldwood Hint Editor, 55 West 44th Street, New York 36, N. Y.

HAVE A QUESTION? Send it to "The Weldwood Question Box," 55 West 44th St., New York 36, N. Y.

Constructing this desk-sewing table is really easy. For it is made of Novoply® panels framed with angle irons. Novoply is Weldwood's 3-ply all wood panel made of resin-impregnated wood chips and flakes fused under tremendous heat and pressure. Because of this exacting construction, Novoply panels are extremely stable and virtually warp-free! You'll find Novoply easy to work—resists splitting from nails or screws.

Novoply has a textured, mosaic-like appearance that's handsome and distinctive. So you can either finish it natural—paint it—or cover it with durable Micarta® for scuff-proof, scratch-resistant service. Send for plans today, and see if your kids don't *almost* enjoy doing homework this year.

W.T.M. Reg. Easi-Bild Pattern Co.

THE WELDWOOD QUESTION BOX

Q. I've got an old, scratched, and banged upright piano that still has a good tone. Is there any easy way to refinish it or "dress it up" so it will look as good as it sounds?

A. Of course you could scrape the finish off down to the bare wood, but that takes a lot of elbow grease. Why not try this: bond $\frac{1}{4}$ " thick Weldwood hardwood plywood to the exposed parts of the piano with Contact Cement (one quart should do the job). With the big

4' x 8' panels you can cover the piano quickly and handsomely. You can choose from a great variety of woods, too. Birch, for example, will give a nice modern appearance, while mahogany will blend in well with traditional furnishings. Remove ornamentation such as carved moldings, and roughen the polished surfaces with sandpaper to assure good bonding. Take the piano case apart and cover each part separately to make the job easier.



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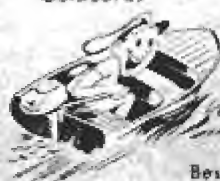
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of the minerals on the dump. Eventually, as our richest mineral resources are used up, it will become standard practice to extract as many as 20 or 30 products from any one mining and milling operation.

In a few unique cases this is being done today. American Potash & Chemical Corporation extracts more than 20 chemicals from the brine that it pumps from alkaline deposits lying under Searles Dry Lake in California. Among other products taken from the brine are table salt, salt cake that is used in detergents, potassium chloride that is used in fertilizers, soda ash for glass and washing compounds, borax, sodium phosphate, sodium bromide and lithium chloride.

These and other chemicals are removed from the brine in a series of distillation and precipitation steps. Some of these steps are complicated, some are extremely simple. One worth mentioning is the way that Glauber salt is extracted from the brine. This substance precipitates out of solution at 55 degrees or less. At Searles, brine is simply sprayed into the air above the lake bed when the temperature is below 55 degrees. The Glauber salt collects in big piles under the spray heads. The sprays are automatically turned off when the temperature rises above the critical point; otherwise the precipitated material would go back into solution and drain away.

The Searles operation is exceptional because all its minerals are in solution, a situation entirely different than when handling a rocky ore. But it points the way to the metallurgical and chemical tricks that will be devised for extracting numerous ingredients from many kinds of ore.

We know now that even "barren" granite contains a rich variety of metals. And we know that the rock also holds more than enough atomic energy to perform the work of extracting the metals, with energy left over. The time when we will be mining granite may be a long way off, yet it is interesting to speculate on what our resources will be when that time does come.

Suppose that a few centuries from now the United States becomes much more industrialized than it is at present. Suppose, too, that industry in all other parts of the world rises to the same high level. By then, the world population may well have grown to 30 billion persons.

Such a population might consume rock for its metals and atomic fuels at the rate of 1500 billion tons per year.

Would we soon run out of rock? Hardly. Assuming that all the land areas were available for such processing, man would "eat" his way downward at the rate of less than one tenth inch per year! ★ ★ ★

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"PLASTIC WOOD"

Multiband Converter

(Continued from page 167)

Coupling

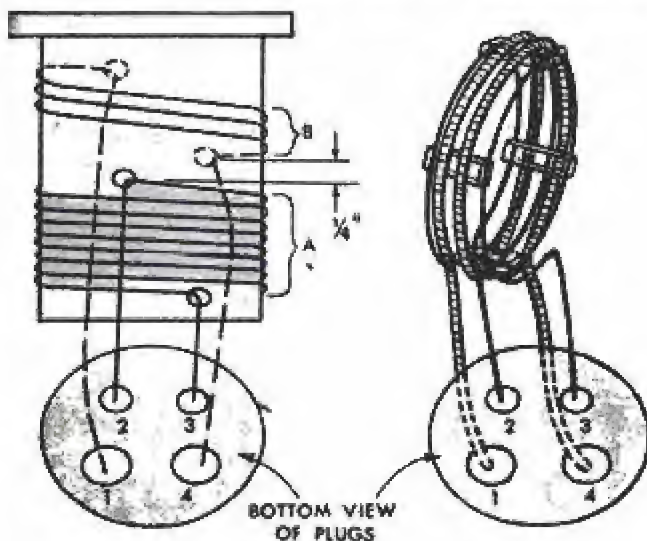
Coupling the converter to your radio can be done in a number of ways, depending upon the type of antenna included in your set. Most sets have one of three types; a built-in antenna loop, the newer type of ferrite-core antenna, or an outside terminal for the connection of an external antenna.

Coupling to the first type (the built-in loop) is simple. Merely construct the "coupling loop" shown in Fig. 5 and plug it into the output jack of the converter. Secure this loop to the back of the radio, in the vicinity of the radio's loop antenna. In

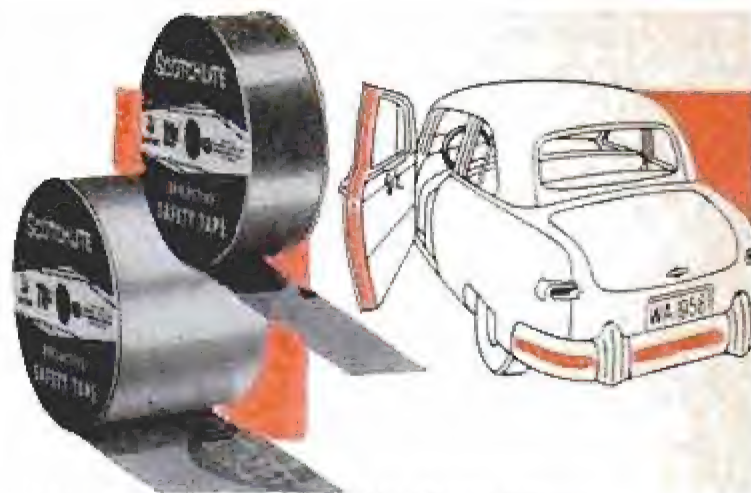
COIL-WINDING DATA

BAND	WINDING	L1 ANTENNA COIL	L2 OSCILLATOR COIL
80 Meter (2.6-6.4 mc.)	A	30½ turns, close-wound No. 26 Enam. wire	18 turns, close-wound No. 22 Enam. wire
	B	11½ turns, close-wound No. 26 Enam. wire	
40 Meter (5.3-14 mc.)	A	14½ turns, close-wound No. 22 Enam. wire	10½ turns, spaced to occupy ¾-in. No. 22 Enam. wire
	B	4¾ turns, close-wound No. 22 Enam. wire	
20 Meter (10-27 mc.)	A	8 turns, spaced to occupy ¾-in. No. 22 Enam. wire	4½ turns, spaced to occupy ½-in. No. 22 Enam. wire
	B	4¾ turns, close-wound No. 22 Enam. wire	
10-15 Meter (20-45 mc.)	A	4 turns of B&W Miniductor Type 3014	3 turns of B&W Miniductor Type 3014
	B	2 turns insulated hookup wire, wound over winding A	

Fig. 4. Construction of plug-in antenna coils. Form at left is used for all but the highest frequency band. Oscillator coils have only a single winding



(Continued to page 260)



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More complete night safety. Reflects up to 200 times more light than other parts of car. Red, 1"x30" (C2599)39¢
Red, 2"x30" (C2594)78¢
Silver, 1"x30" (C2593)39¢
Silver, 2"x30" (C2595)78¢



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most cases, the two loops will "couple up" even if they are an inch or two apart, providing they are properly oriented. You may have to try various positions of the converter loop to obtain best results.

Coupling to type two (with the ferrite-core antenna) is just as simple. Wind about 10 turns of insulated wire directly over the ferrite loop coil. Attach a pin plug to the other end of this wire and plug it into the converter output jack.

For type three, where the radio has an external antenna connector, connect a single piece of hookup wire to this connector. The other end of the wire is plugged into the converter output jack.

Adjustment

Proper adjustment of the converter is simplified by the broad-band design of its i.f. stage. Having coupled the unit to your radio, attach an antenna to the converter and set the i.f. tuning slugs protruding through the side of the chassis approximately halfway in. Now, turn on the radio and set its tuning indicator to some frequency between 1400 kc. and 1600 kc. *where no broadcast station is normally heard.*

Plug the two 40-meter coils into the proper converter sockets and set the band-set capacitor, C2, and the mixer-peaking capacitor, C1, to the half-open position. Now, turn on the converter and, after allowing the tubes to warm up, slowly rotate the bandspread capacitor, C3. You should be able to tune in some of the stronger short-wave stations immediately. With a station tuned in (one of the high-speed code stations which emit a kind of raspy buzz is ideal for this purpose), readjust the i.f. tuning slugs for the strongest signal, and retune the mixer-peaking capacitor for maximum volume.

When this is done, you have accomplished

Fig. 5. Construction of loop used for coupling from converter to radios with built-in loop antennas



(Continued to page 262)

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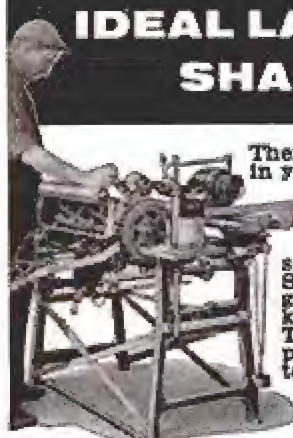
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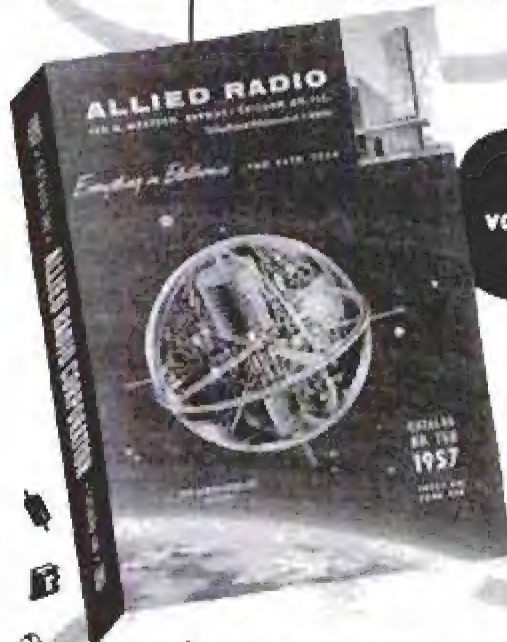
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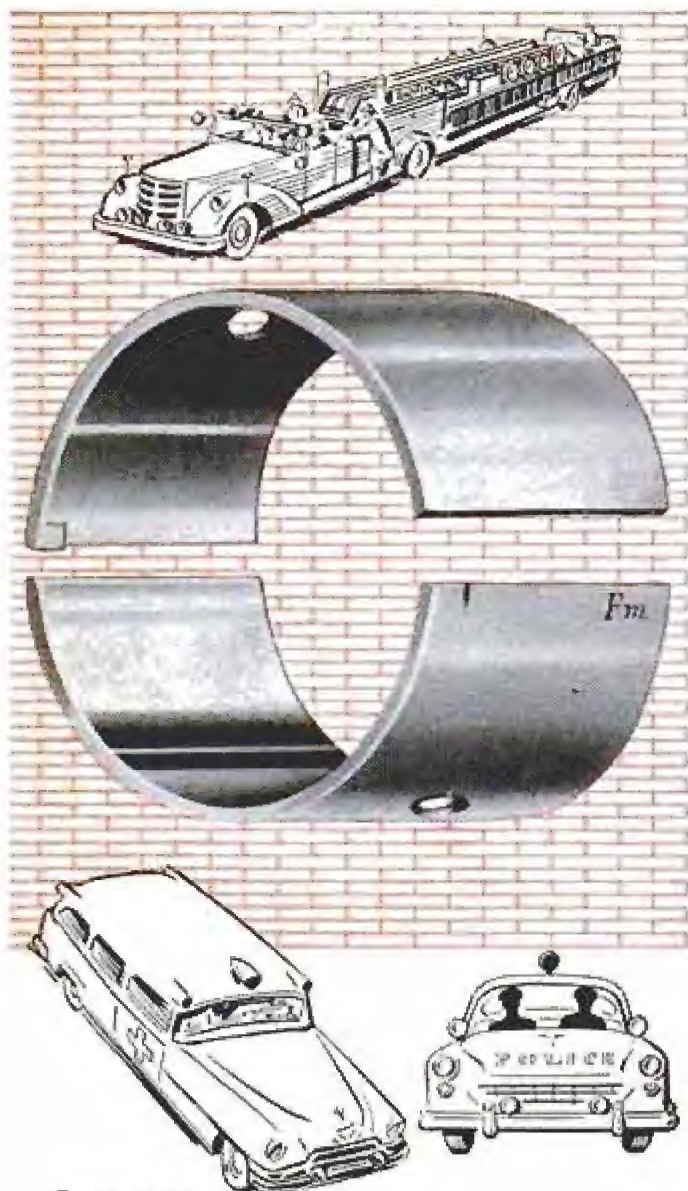
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the following: 1. The converter i.f. stage is properly aligned and will need no further adjustment, and 2. the mixer is properly tuned to give satisfactory performance over the complete range covered by the bandspread capacitor. Other stations within the band can then be tuned in merely by rotating the bandspread capacitor.

Each set of coils is designed to cover a number of short-wave bands. To tune in a different band with the same set of coils, reset C2 to a different point and adjust C1 to have about the same degree of plate opening (if one is $\frac{1}{2}$ closed, the other should also be approximately $\frac{1}{2}$ closed). Again, tune in a station with the bandspread, and peak C1 for maximum volume. This mixer setting need not be changed unless the band-set capacitor is once more readjusted.

All this is more difficult to describe than to do. After getting the "feel" of the converter, you will have little trouble in tuning to the stations you wish to hear.

One caution: On the high-frequency bands, 20-meter and 15-meter coils, there may be two settings of C1 which will produce the strongest signal. Actually, only the lower, the one at which the mixer capacitor is more nearly closed, is the correct one.

What can you pick up with the converter? That depends on the sensitivity of the radio with which it is used and the length of the antenna. Assuming an average a.c.-d.c. set (with its own i.f. stage) and a 60-ft. or longer antenna, foreign stations and amateurs from all over the world will come pounding in. In one test conducted by the author, New Zealand amateurs, in the 15-meter band, were hammering through on a Sunday afternoon in broad daylight. ★★ ★

Recording-Level Meter

(Continued from page 168)

shortened, to prevent damage to the rectifier due to overheating. The electrolytic capacitor should be wired into the circuit with the indicated polarity.

Although the meter scale is calibrated in microamperes, the actual calibration is unimportant. All you need is a relative indication of the signal level. Since every recorder is different, the absolute meter readings which will indicate too strong or too weak a signal must be determined by experimentation. To do this, first adjust the volume control of the recorder so that this instrument will provide "quiet" recordings when no signal is applied. This is done by recording a few feet of tape (if a tape

(Continued to page 264)



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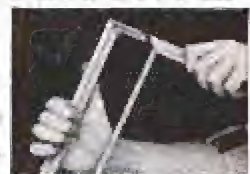
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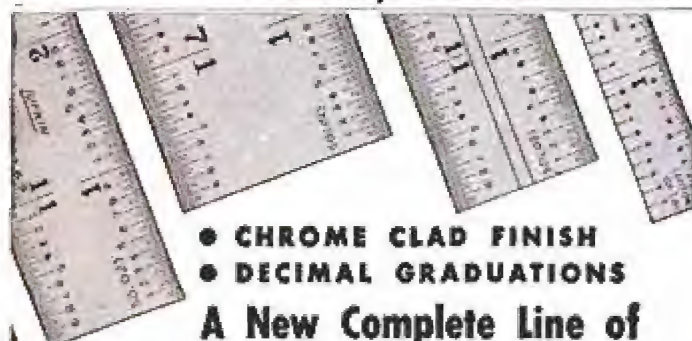
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recorder is used) with no signal source connected to the recorder input jack, and volume control turned up about halfway. Then listen to your recording of "nothing." If excessive hiss or noise is present, repeat the procedure with a lower volume-control setting, until quiet reproduction is obtained. Then, interconnect the mixer, level indicator and recorder, and record a few minutes of a radio program. Adjust the volume of the radio so that the meter pointer deflects about half-scale on the peaks of the program. Play back the recording to determine if the peaks are distorted. If so, try it again for a lower setting of the radio volume control. The highest peak meter reading which gives undistorted recordings is the maximum usable recording level. A line can be drawn on the meter glass, with a wax pencil, to indicate this level.

To determine the lowest usable level, make a short recording from radio with the volume turned down so that it barely deflects the meter pointer. If this level is too low to record satisfactorily, as determined in the playback, try it again at a slightly higher volume, until the meter reading which indicates the lowest usable signal has been determined. Again, draw a line on the meter glass to represent this level. When the meter is calibrated in this manner you are assured of good recordings at all times merely by adjusting the gain controls of the mixer-preamplifier to keep the meter pointer within the two indicated limits.

While designed specifically for use with the mixer-preamplifier described last month, this recording-level indicator could be used directly with any tape recorder having a monitor jack. However, some modifications may be required. The circuit is designed to deflect the meter pointer full scale with an applied audio voltage of about 0.4 volts, rms. The output voltage at the monitor jack of most recorders is considerably higher than this, and the value of the 1000-ohm limiting resistor must be increased so that the current through the meter is reduced to a safe level. To determine the correct resistance value, temporarily replace the 1000-ohm resistor with a 100,000-ohm rheostat. Set this control for maximum resistance, and make a recording from radio, with the recording-level meter plugged into the monitor jack. While recording, vary the resistance of the rheostat until the meter pointer just goes off scale on the signal peaks, as determined by the built-in neon bulb. Then, measure this resistance with an ohmmeter and replace the rheostat with a fixed resistor of a slightly higher value.

★ ★ ★

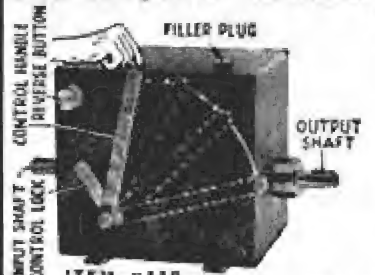
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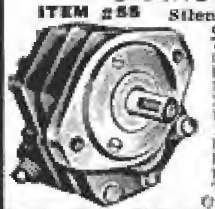
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2000 Watt Generator **149.50**

SAVE \$30.30 ON THIS PESCO HYDRAULIC CONTROL VALVE



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Surgery performed on a dog is demonstrated in the veterinary college using color-television close-ups

Electrons Join the College Faculty

(Continued from page 85)

reel so the fencer can move freely—like a fish the angler is playing. Each fencer's reel is connected to the judge's electronic recording panel.

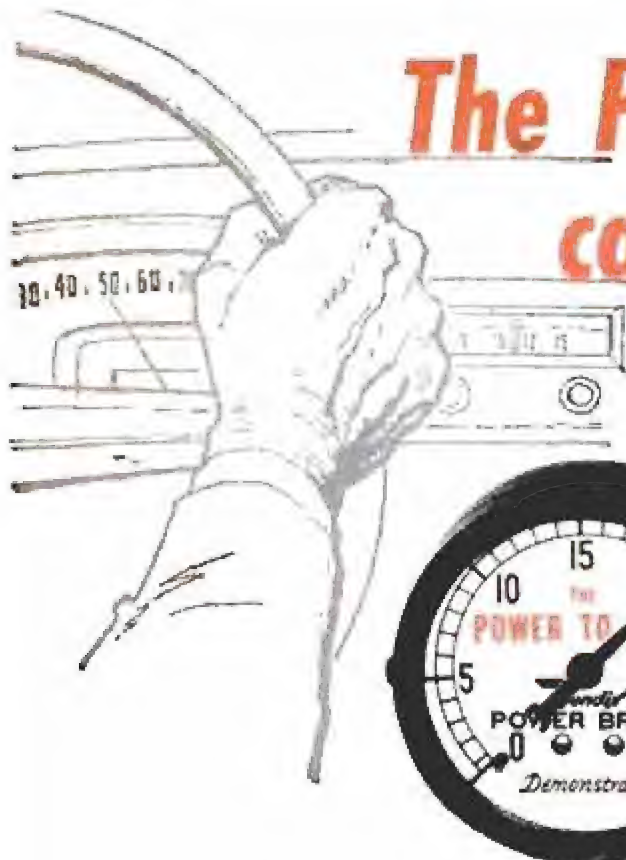
The first hit sounds a buzzer and lights a bulb. Even if the opponent's hit is only $\frac{1}{25}$ second later, the recorder blocks it out. With such refereeing, there's no crowd boredom and no argument.

With our other great universities, Cornell opened new vistas of knowledge with its atom smashers, radio telescopes and other electronic tools of "pure science" research.

Like others, its knowledge hunters have gone strange places to do odd things. Below Lake Cayuga's waters, 2250 feet down in a vault of America's deepest salt mine, they've run a battery of 48 geiger counters measuring cosmic-ray power. In jungles and atop mountains, Prof. P. P. Kellogg has tape-recorded rare birds. With stroboscopic photography, and electronic hook-ups inside close quarters with 3000 volts only three feet from his face, Prof. Donald B. Griffin discovered the "radar" method by which bats utter supersonic cries to guide their flight even when they are "blind as bats."

Thus, universities now find wide usage

(Continued to page 268)



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Once you've tried Bendix* Power Brakes—and marveled at the difference they make in stopping ease—you'll demand them for your present car, whatever its make. Ask for a test ride today. Car dealers, better garages, service stations and brake shops across the country have cars equipped with Bendix Power Brake Demonstrator Units. When you've seen the difference, *felt* the difference, you'll know they're the finest automotive buy on the market. And get this: Average price—about \$60 (including installation)!

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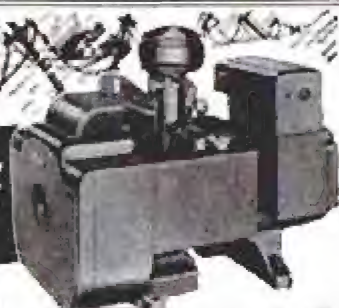
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Fits any Electric Drill, Lathe, Drill Press, Motor

Exclusive "Slug-Ejector" pops out discs immediately—therefore works 3-times faster than other hole saws selling for twice as much. 7 shatterproof blades easily exchanged to cut 1", 1 1/4", 1 1/2", 1 3/4", 2", 2 1/4" & 2 3/4" holes thru any 3/4" stock. Safety-lock screw prevents blades from "jumping out." Incl. 1/4" drill bit..... **\$6.50**

No. 600 "ARCO HOLE-SAW"—as above, but with 4 blades to cut 1", 1 1/4", 1 1/2" & 2" holes..... **\$4.95**

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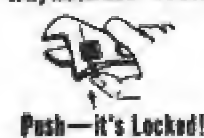
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UTICA's brand new SELECT-O-LOCK adjustable wrench gives you two tools in one.

Push the magic button—the wrench is locked—just like an open end wrench.

Pull the magic button, it's a conventional adjustable wrench.



See the new SELECT-O-LOCK, No. 93, adjustable wrenches in 6-8-10 and 12 inch sizes at your hardware dealer.

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THE HALLMARK OF QUALITY



Professors check recorded lecture from library which includes talks on anything from gardening to moon

for the electronic gadgets that their research produced. For example, Prof. C. W. Gartlein has been studying the role played by the hydrogen of outer spaces in causing the aurora borealis. Sitting up all night would be one way to take recordings. But he and his students can do it while they sleep. A photoelectric cell records intensity of the northern lights, and a spectrograph chart identifies the hydrogen.

There can be college rivalry in science, too. Cornell has built closed-circuit color TV into its new veterinary-medicine building. It wanted to be first to use such television to show future dog, cat and cow doctors how to do their work.

But the University of Pennsylvania also wanted to claim first. With Cornell's initial show scheduled for last January 6, Penn arranged one for the day ahead. However, January 5 was the day Philadelphia had a power failure. Penn's show couldn't go on, and Cornell University's show "breezed home" the winner.

Part of Cornell's pioneering in offering courses in such things as transistors and use of the electron microscope is due to having strong engineering and science departments which date back to founder Ezra Cornell himself. This versatile genius was first to hang wires from poles to make a long-distance telegraph line. After building the line used by Samuel Morse in his

(Continued to page 270)



Spare time income — or full-time business

CASH FILING SAWS

make up to \$3-5 an hour in home workshop
with FOLEY SAW FILER

Here is a steady CASH business you can start at home in your basement or garage, while you are working at your regular job. No experience is necessary to turn out perfect cutting saws—"the first saw I sharpened came out 100%," I think the Foley Saw Filer is a marvel of perfection," writes Clarence E. Parsons. Every saw you sharpen will bring you new customers. You will find you can make up to \$3 or \$5 an hour—\$20 to \$30 a week in your spare time as a starter.

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Complete with
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Aircraft Type 200-250 Amps. 24 Volt D.C. 4500 RPM. Makes a dandy arc welder. Cost GOV'T. \$400. SPECIAL \$14.89. Like NEW! Diagram Included Free. F.O.B. York. NEW '57 catalogue with 1000's of other big bargains—10c.

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Other models on application

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50% MORE PRACTICAL
MALL 3/8" DRILL KIT

Mall

\$37.95

"POWER PLANNED"—does all usual kit jobs and many more

New 389 kit does hard jobs in cement, steel and stone as well as in wood. Rugged 3/8" drill has geared chuck and key, 650 RPM, 60 cycle, 115 V. AC-DC motor, cord, switch and plug. U. L. approved. Ideal for masonry, for precision polishing and sanding. Bits, pedestal, pads, discs, handle and steel chest included. Get 50% more practical, more efficient MALL 389 drill kit wherever high quality tools are sold.

HU-234

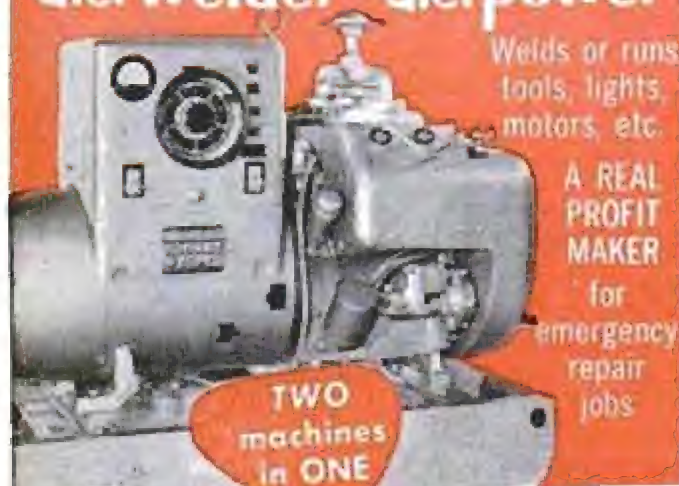
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Guide

NAME _____

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famous demonstration between Washington and Baltimore, Cornell went on to be cofounder of Western Union.

But the university also takes pride in its special shopping center called Electronic Stores. This warehouse is a sort of paradise for professors and students seeking parts of all kinds, and does around \$80,000 business a year out of stock or 25 drawers full of catalogs that can get it for you wholesale, or surplus.

Researchers from the Advanced Electronics Center which General Electric has established at Cornell drop in for tube testers and transformers needed in a hurry; and so do the "Home Ec" girls who want "pretty wires" they can use in making designs.

Veterinary teachers shopped here and built a heart-stimulating machine, with two spoon-shaped handles that squeeze helpfully around the animal's heart during an operation, and psychology got parts for the "lie detecting" apparatus proving that neurotics complain more but live just as long as normal folks do.

Parts for the pie tilter came from here. Another time, an aggie student had an assignment to count the flies in an ordinary barn. He brought his problem to Tito Capogrossi, the store manager, and ended up with a gridwork of charged wires spaced just right so that the flies flew between them and shorted circuit with their wings. The rest was just counting dead flies.

Capogrossi uses electronics in selling electronics. On a display panel, for example, he has 50 gadgets ranging from a constant-temperature oven to the device that reels in the antenna of a bomber. He demonstrates these by means of remote-control switches.

It's a store operated by Cornell for the needs of its own departments, but will help out other universities—like the P-4 gun computer off a B-29 which cost Uncle Sam \$23,000 new, and which Cornell sold for \$20 to the University of Arkansas where it was torn apart for its servomechanisms.

The only item Capogrossi will sell to just anybody is his "white elephant"—an Air Force navigation trainer completely equipped with dummy instruments. Originally worth several thousand dollars, Cornell has spent \$250 advertising this unpopular surplus item and will unload it, at latest quotation, for \$10.

To make the work of its professors more efficient, the university now has a tape-recording center. It stores lectures by leading authorities on anything from care of a home garden to making radar contact with the moon.

(Continued to page 272)

REPAIR MUFFLER AND EXHAUST LEAKS in 10 min.

The plastic gas-tight seal sets hard, withstands heat and vibration. Prevents carbon monoxide gas poisoning.

SETS LIKE A WELD — NO TOOLS NEEDED

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Also Eshelman TRACTORS. Riding ROTARY MOWERS. ROTARY TILLERS

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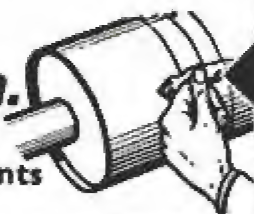
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Install this superior HYDRAULIC EQUIPMENT Yourself!
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OIL POWER CO., BOX 172, WAUKESHA, WIS.
SEPTEMBER 1956



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WORN ENGINE BURNING OIL!

Increases miles per gallon!

Restores compression!

Reduces oil bills!

*** Piston Seal \$4.95** Tube for most cars
Forms self-lubricating seal at piston top. Inserted through spark plug holes. Used by millions of motorists. Tested and approved by motoring experts.

*** PISTON SEAL**

\$40 for 1 1/2 DAY'S SPARE TIME WORK GRINDING LAWNMOWERS

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First time ever! It REVERSES!

Drive and remove screws with SupremeVersamatic. Versamatic reduces speed 7 to 1, increases power 7-fold. Reverses with one twist. Handles even the largest screws with ease. Also for nut running (adapter furnished); tapping; and all heavy duty drilling where speed reduction is needed. Fingertip control means safe, fast work. Complete set \$14.95. (1/2" chuck extra). At better hardware stores.

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FOR SKILLED WOOD-WORKERS ONLY!

No. 2500
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SYNCR

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JIG SAW

At last—a jig saw designed only for the few real homecrafters who demand, use and appreciate the best in tools! This heavy 62 pound ruggedly constructed Syncro "2500" slices thru 2 x 4's or cuts intricate designs with almost unbelievable accuracy and smoothness. The entire arm—not the table—tilts 45° to either side. Powered with Syncro's latest Reciprocating Motor—guaranteed against burn-out during ownership. Sure, 2500 costs you more but it does more than others costing more! This masterpiece—designed for master wood-workers only—is already a favorite of industrial wood pattern-making shops. So new your tool dealer may not have it. Write for Free details.



Table stays level; arm tilts; beveling is easy.



Full 30" Throat

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AT LUMBER OR BUILDING MATERIAL DEALERS

In addition, "thinking machines" of various sorts have been added, in specialized courses, to such aids as the electronic microscope. For example, psychology now has an electronic profile-analyzing computer (EPAC) which solves complicated data and gives the answer in a bank of neon lights on the control panel.

Similarly, electrical engineering has an a.c. power network calculator—a roomful of electronics—as well as a homemade pipeline network analyzer that shows how to operate the water and gas lines of a large city.

The mathematics department has its own computing center organized around a card-programmed electronic calculator (CPC) which is not only used for training its own students but figures out at \$25 per hour rent for any other department that wants to use its brainy automation. But research students get its work done free.

Besides teaching youth with plug-in techniques, Cornell also drops the flunking ones with equal efficiency. This is done by setting exams up in true-or-false fashion, with electronic computers in the testing center rattling off the score.

Even in standard exams, the professor works with a stack of prepunched score cards. He "mark senses" each with a special pencil. If the student earned a 76, the pencil circles a 7 and a 6. Suppose he played hooky? Then a line is drawn through the score called "absent from final."

The cards are turned in to the university's central machine records division. Here's where 10,000 students are "stored" in cabinets. Each becomes an IBM card the day he applies for admission. It tells who he is, what course he is taking, and so on.

From all over the campus, the progress of each student comes to this office's accounting machines, sorters, collators and calculators. From one semester to another, he is punch-carded along the path to the day when the electronic bookkeeper scans his master card and clicks him off as eligible for a sheepskin. ★ ★ ★

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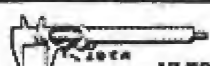
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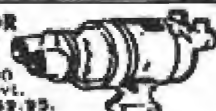


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Don't Stop Fishing at First Frost

(Continued from page 111)

time-honored secret. I drove myself nearly mad, crawling and sneaking along this small stream and flipping a small frail fly in spots where big trout lay, fanning their broad tails. It was very exasperating. The trout would ignore the fly even though I thought it was presented perfectly. By noon I had coaxed but a single strike and hadn't landed a fish.

I was resting under a dense-crowned tree and enjoying lunch when I sighted this stooped old man creeping up on the very hole I'd just fished in vain. His rod cocked back and line uncoiled across the water. The bait had no sooner touched water than there was a splash and the rod arched over and bucked in his hand. Dropping my lunch, I streaked down to where he was standing. I could see the long trout slicing through the water. It was a beauty.

Presently, the old man brought the large rainbow to net. He held the 19-inch fish up for me to admire, but I wasn't interested in the trout. What caught my eye was the monstrosity of a fly cradled in the fish's mouth.

"What's that big fly you're using," I asked, flabbergasted.

"It is an oversized version of the Silver Doctor," the old man confessed. "You've got to use large baits this time of year if you want results."

Feeding for Winter

He went on to explain why. During late fall, trout are beginning to feast in preparation for the lean days ahead. They want the biggest mouthful of food they can possibly find, and that's why No. 8 flies often produce better than 12s or 14s. Also, the first freeze kills off all insects except the larger, tougher variety. Next time you're on your favorite trout stream in the fall, study the insect life closely. You'll find this to be true.

I only regret I was unable to get this old man's name before he got away. He made a great contribution to my fishing career, and now I enjoy supreme trout fishing when there are fewer anglers competing and, although the fishing is more baffling, I catch larger trout than I ever would on opening day.

I'll readily admit there's an advantage to being on a trout stream at dawn during the first few weeks of the season. But along into the fall, trout do most of their feeding during midday. As the day progresses, the sun warms the water surface slightly and trout may start feeding. Even a few degrees

(Continued to page 276)

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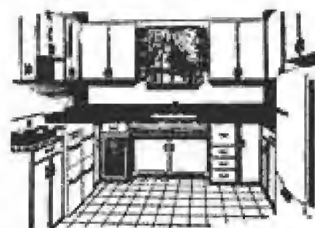
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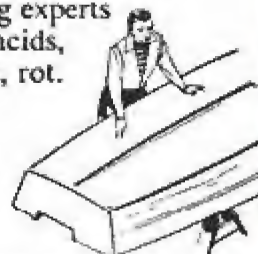


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drop in temperature decreases metabolism of trout and reduces their appetites.

Insects also begin to stir later in the day during fall, with the greatest activity coming during midday.

If there are signs of surface feeding, you might do well to give dry flies a whirl. Drab creations will do better than bright multicolored flies, I've discovered, and the best sizes seem to be about No. 10s or 12s. When fishing in this manner, pay particular attention to staying hidden and let no shadow betray your presence, not even from line or leader.

Trout Moving Upstream

Spawning still is another point to consider when trout fishing in the fall. Brookies and browns are moving upstream to find clean gravel bars or such to lay their eggs. If you're not having any luck in your regular trout holes, try locations where small creeks empty into the stream or other such spots where there might be a spreading fan of clean gravel in running water.

Swirls behind small boulders are good spots for brookies to hang out. Also where a white-water chute spreads out into a long slick hole, even though the water may be only ankle deep. Pitching a fly into the head of the current and letting the water carry it naturally into the slick part will many times bring a wallop strike.

A complete reversal of the early-season upstream-fishing procedure is called for in the fall. If you try to toss a fly upstream, the fish can see the shadow of the line on water and will scurry for cover. Feeding the line into the current and letting it ride unhindered downstream will do much better, but watch drag and don't let your line or leader betray the fly's naturalness.

Artificials Pay Off

Artificials have paid off much more consistently than natural bait for me during fall. I've tried minnows and worms with various degrees of success on autumn trout, but the larger fish I've taken on artificials. A big minnow hooked through the lips and drifted with the current often will take a lunker trout, and worms are a handy standby that pay off when all other methods fail.

You can catch trout—big ones, too—throughout the fall season. You're going to have to adapt your presentation and approach to weather conditions, though, and this autumn trout angling requires an uncanny skill uncalled for earlier in the year.

If your state has legalized trout fishing during the fall, or such a place is within a short drive, you're certainly missing something by not giving these autumn trout a fling. Try it sometime. ★ ★ ★

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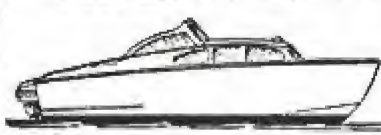
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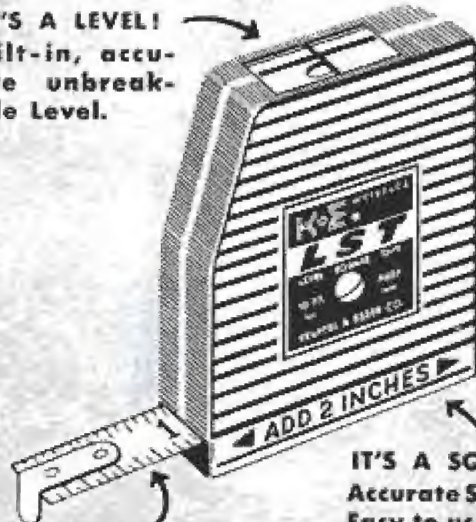
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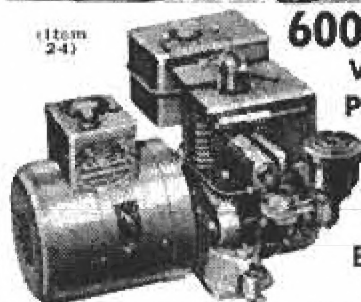
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No. 14-8 Conductor Power Cable. Heavy duty very flexible, rubber covered, with 4 contact plug & socket. Ideal for tractor-trailer connections (Item 796) 15 ft. **\$9.95**



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A tremendously powerful press capable of exerting nine tons of pressure. Pays for itself straightening bent parts, or pushing out bearings and bushings. Ideal for manufacturing and assembly operations because of precise control. Massive 1 1/2" screw permits precise control over vertical travel. Extra heavy ribbed yoke has a throat 31" high, depth capacity for working to the center of an 11" object. Includes 8" x 13 1/2" vise-type table and four machining arbors. Wt. 150 lbs. (Item 797). Reg. **\$49.50**, Special..... **\$49.50**

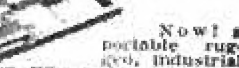
HYDRAULIC PRESS. Nine ton capacity. See Aug. Pop. Mech's. ad for details — or write. Complete, Wt. 110 lbs. (Item 464)..... **\$69.50**



(Item 280)

MASTER DC ARC WELDERS

Now! a portable rugged, industrial type welder with terrific performance, yet at a price hundreds of dollars less than you'd expect. Senior model made for years of trouble-free, continuous service. High capacity DC welding unit enables you to tackle any job with confidence — easily welds anything up to 2" plate using from 1/16" to 1/4" rods. Built-in stabilizer and cooling system makes arc easy to strike and hold. Dual control rheostat provides low heat soldering, brazing and welding from 30 to 300 amps. Complete with instructions, guarantee and triple V-belt or flat pulley. Easy to hook up and easy to operate. **WELDER ONLY — DUAL CONTROL MODEL.** Same as above, but drive with your tractor, jeep or gas engine of 14 HP or more. (Item 38a) Wt. 110 lbs. \$450 value..... **\$119.50**
WELDER ONLY — INDUSTRIAL MODEL same as above but with ceramic rotary type rheostat providing 74 different heat settings for all types of welding (Item 38b) \$500.00 value..... **\$139.50**
COMPLETE POWER MASTER — Illustrated above powered by a 14.6 hp., air cooled Wisconsin engine. Wt. 480 lbs. (Item 280) Complete with welder costing \$1200. **\$449.50**
Factory Special.....



WELDING KIT Two 10 ft. leads, welding helmet, electrode holder, ground clamp. Sold only with welder at..... **\$10.50**

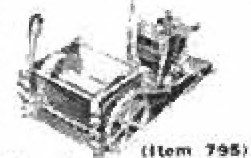
HEATING & VENTILATING FAN

(Item 10) Easily installed in furnace pipes. Forces even heat to all rooms. Over range removes kitchen smoke and odors. Powerful, continuous duty motor, 110-120v. AC. Mount in wall or ceiling to ventilate any area. Quiet, super-efficient fan moves huge volume of air. (400 to 600 CFM).
8" Pipe, wt. 5 lbs. **\$6.85**
9" Pipe, wt. 6 lbs. **\$7.85**
10" Pipe, wt. 7 lbs. **\$8.85**
12" Pipe, wt. 8 lbs. **\$9.85**
HEAVY DUTY FAN. Semi-enclosed motor, suitable for spray booths, restaurant exhausts, poultry houses, etc. 10" Fan, wt. 8 lbs. (Item 106)..... **\$11.95**
12" Fan, wt. 10 lbs. (Item 10D)..... **\$12.95**
HIGH SPEED BARN FAN similar to above, but larger, high speed motor moves huge volume of air.
12" Fan (Item 10D)..... **\$14.95**
14" Fan (Item 10D)..... **\$17.95**



Rugged, ball bearing WINCH

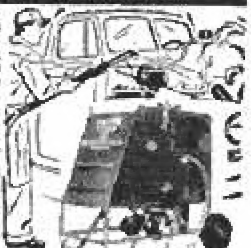
Sturdy ball bearing winch — super tough aluminum alloy construction. Powered by an easy starting 2 1/2 HP Briggs gas engine thru gear reduction drive — it exerts up to 3000 lbs. of terrific force for hoisting materials or pulling. Combination gear and pulley reduction results in tremendous multiplication of engine power. Idle pulley clutch arrangement and built-in drum brake (with ratchet hand lever) enables operator to ease loads down gently and lock at any point desired. Drum handles 400 ft. of 3/8" cable or 600 ft. of 1/2" cable. Ideal for contractors, farm implement trailers and unlimited other uses! (Item 795) Wt. 125 lbs. Only..... **\$149.50**
HAND WINCH — Same winch with large crank handle for extra leverage and 2 speed drive. (Item 794) Wt. 60 lbs. **\$59.50**



(Item 795)

JET STEAM MASTER

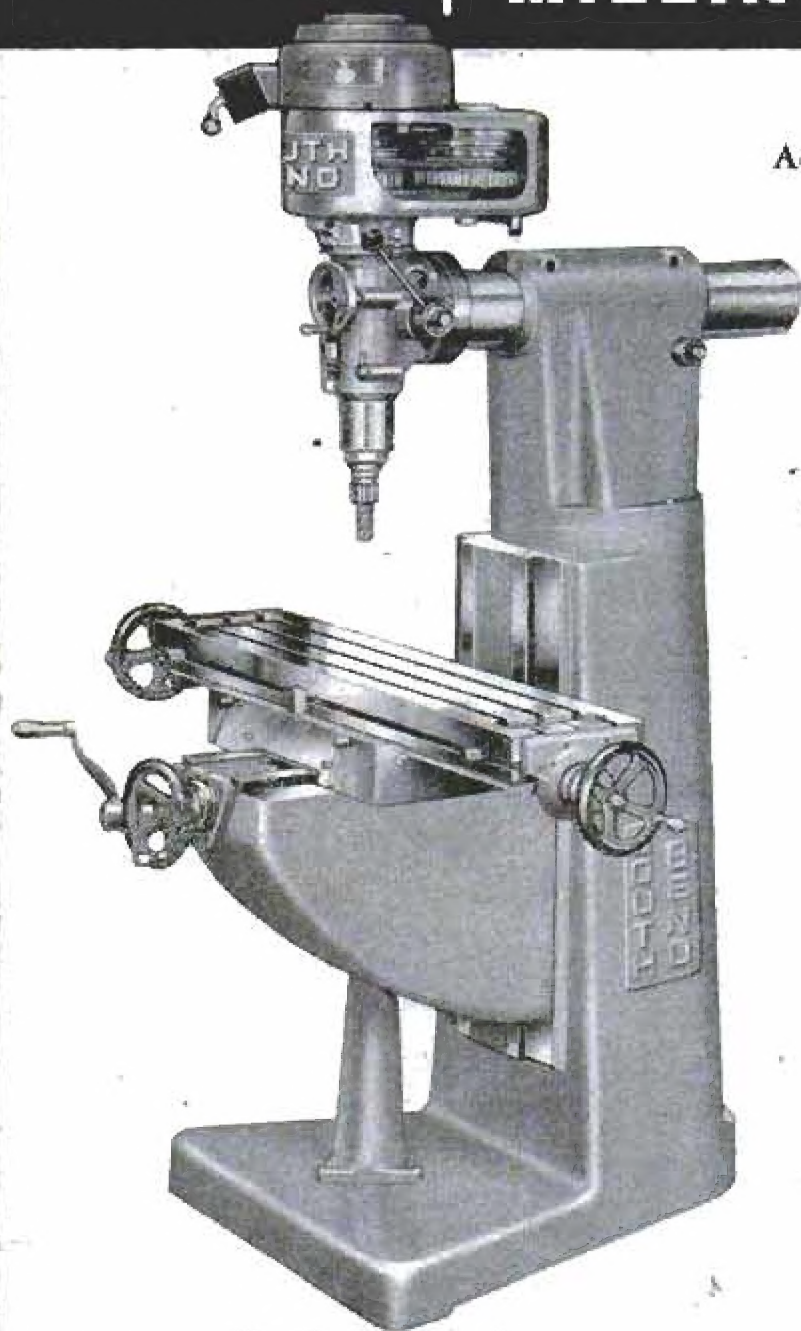
Now, a super efficient portable steam generator that produces live steam at 100 lbs. pressure in 40 seconds from a cold start! Produces large volume of high pressure steam on 2 pints of fuel oil. Instantly cleans sticky grease, dirt, rust, old paint, etc. off implements and road machinery. Pays for itself in a few weeks. Sterilizes soil. Sterilizes as it cleans — milk equipment, etc. Fully automatic — oil fired with new, built-in lifetime bronze water circulating pump. Draws water from faucet or bucket. Simple and safe — anyone can use it; built-in safety valve. Complete with 12 ft. of hi-pressure steam hose and new triple efficiency steam gun that automatically mixes in soap solution if desired. Wt. 250 lbs. Item 463. **\$329.50**
Special factory price.....



Send check or M.O. Prices f.o.b. Factory. 10 day Money back guarantee. SEND 10c for... **MASTER MECHANIC MFG. CO., DEPT. 99-M Burlington, Wis.** **BIG 1956 Catalog**

New

SOUTH BEND PRECISION VERTICAL MILLING MACHINE



Adequate capacity, accuracy and speed give this new milling machine the ability to keep machining costs low on a wide variety of work. Its simplicity of design provides ease of accessibility and set-up. Reduces operation and job change-over time to a minimum. Ideal for toolroom, production and maintenance work. *Write for information.*

LO-LOSS spindle drive. Precision ground and fitted quill.

Positive action controls with large, adjustable, graduated collars.

Power longitudinal table feed and automatic quill feed optional.

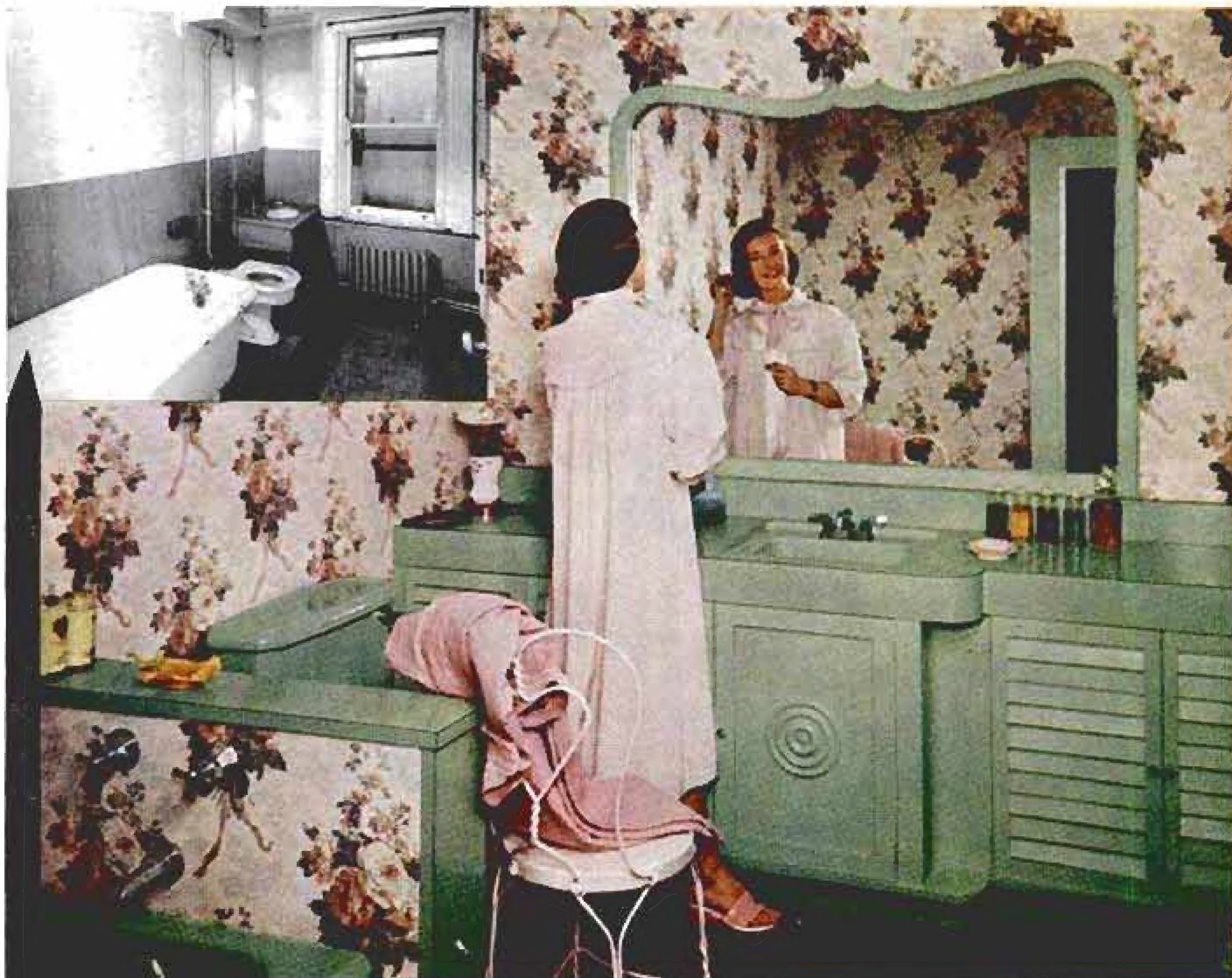


SPECIFICATIONS

Table travel.....	20 or 30"
Cross feed.....	9 1/2"
Spindle to table (max.).....	20"
Spindle to column (max.).....	20"
Ram travel.....	15"
Spindle speeds.....	8
Head rotation.....	360°



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Builders of lathes, milling machines, shapers, drill presses, pedestal grinders



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Complete picture instructions and kitchen and bathroom idea literature. Write . . .

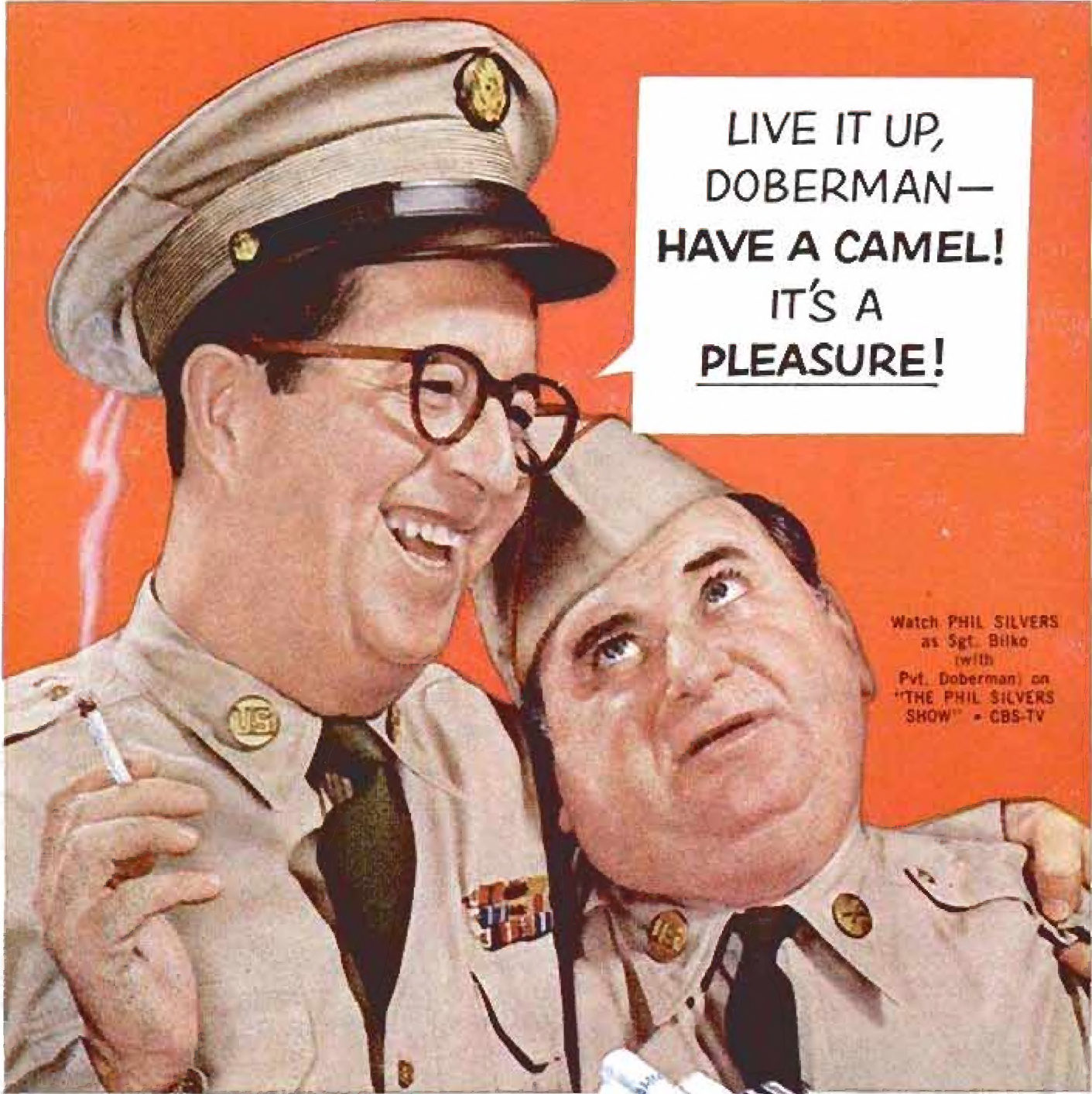
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